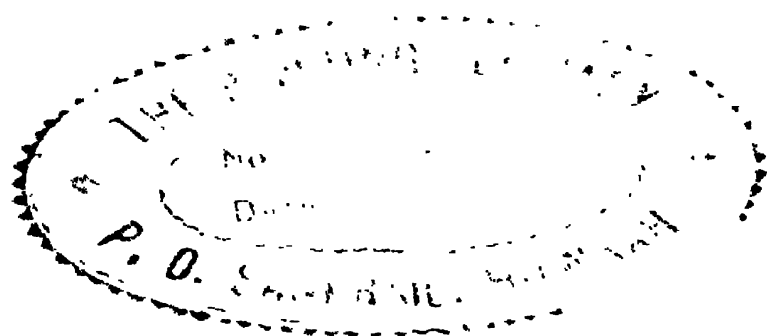




*Italian glazed earthenware plate 16th Century (S. Hans. Museum on loc.)*

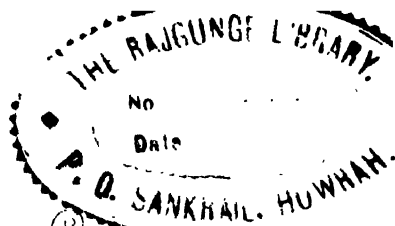


*Italian enameled earthenware vase about 16th Century (S. Hans. Museum)*





THE  
NATIONAL



A DICTIONARY OF UNIVERSAL KNOWLEDGE

By

WRITERS OF EMINENCE IN

LITERATURE SCIENCE AND ART

VOLUME X

LONDON

WILLIAM MACKENZIE, 69 LUDGATE HILL, E C

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Fig 3.

LUNGS OF A BIRD.

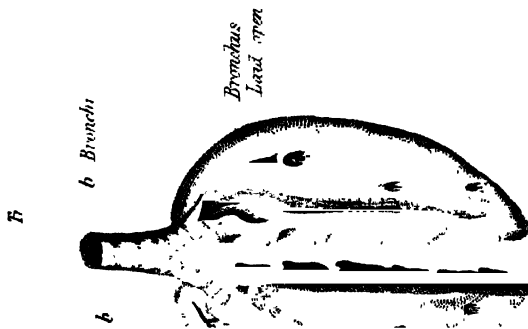
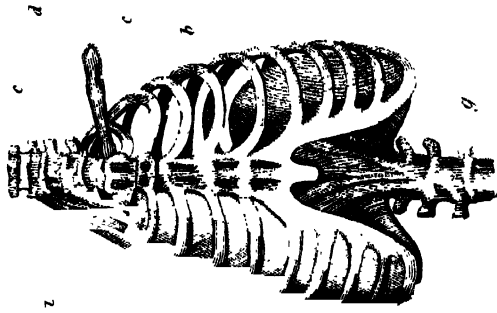


Fig 2

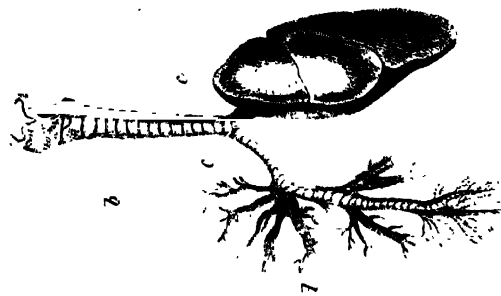
HUMAN CHEST.



a Backbone  
b Breastbone  
c Ribs  
d Diaphragm  
q Inter-costal

Fig 1.

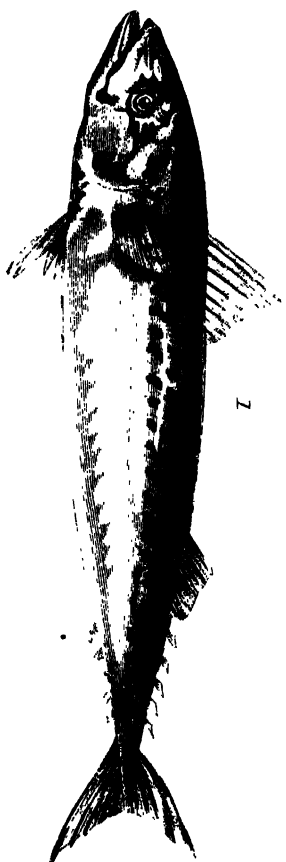
HUMAN LUNGS.



lar  
new  
bron



# N A G K E F E L .



*Scomber scomber.*—Common Mackerel.



*Ephorus tremora.*—Common Herring.



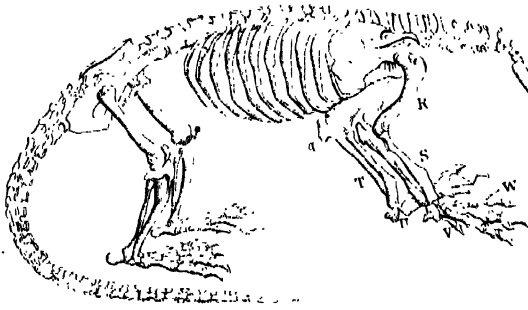
*Zeus faber.*—Dore.



*Merula atripos.*—Black-foot

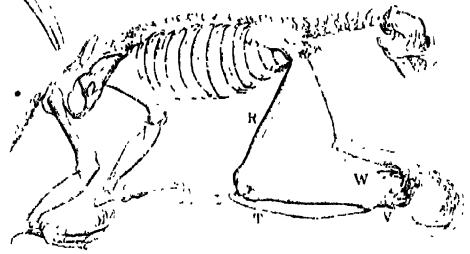


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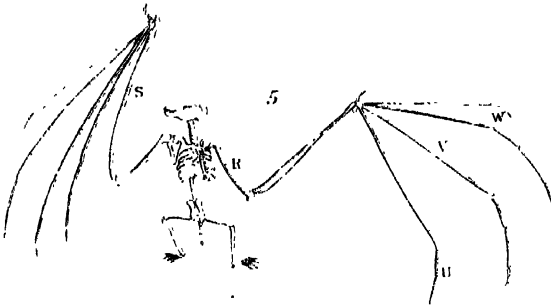


*Myrmecophaga jubata* *Ant-eater*

2



*Bradypus tridactylus* *Three-toed Sloth*



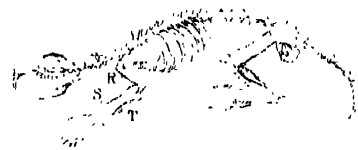
*Vespertilio* *Bat*

3



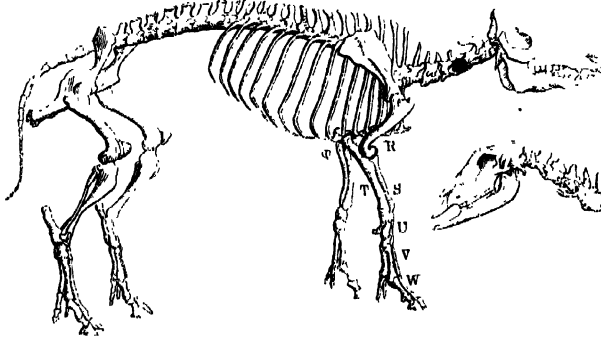
*Talpa europaea* *Mole*

4



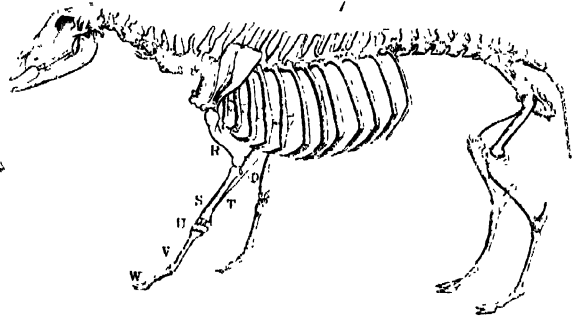
*Mus rattus* *Black Rat*

6



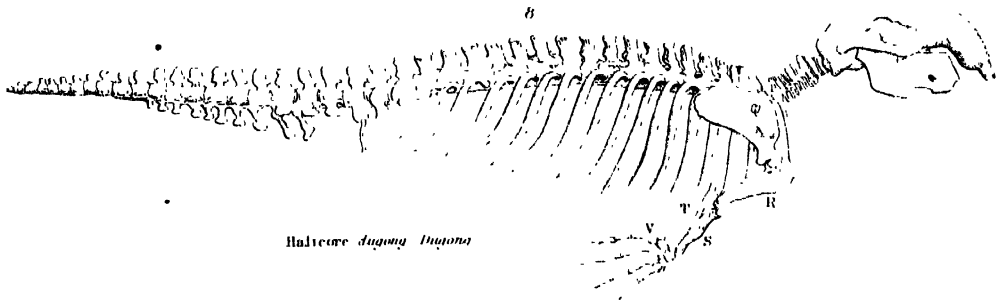
*Sus scrofa* *Pig*

7



*Ovis arvens* *Sheep*

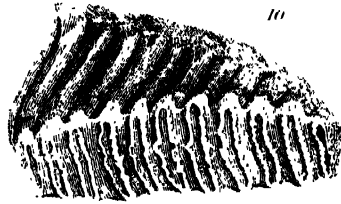




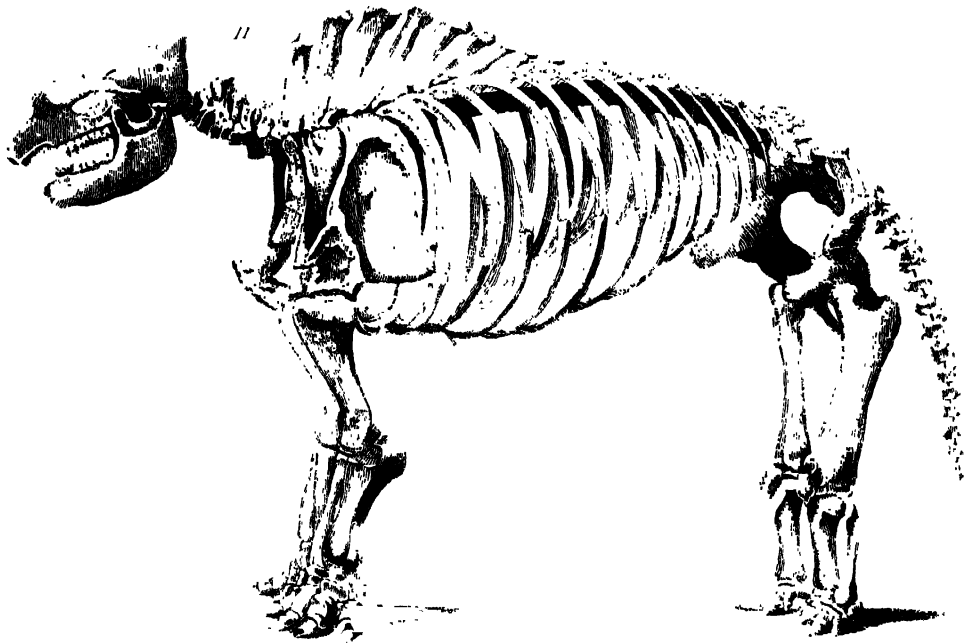
*Halicore dugong dugong*



*Tooth of African Elephant.*



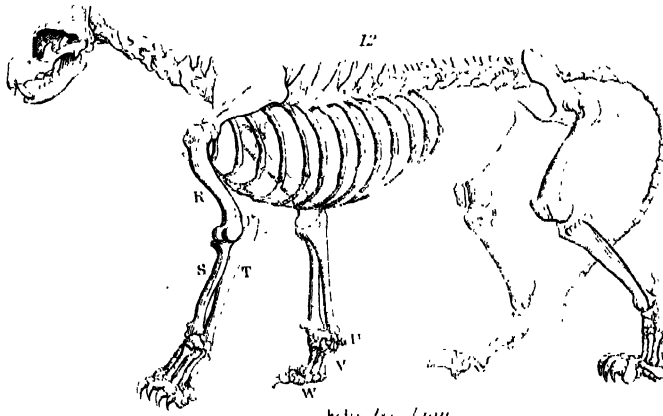
*Tooth of Indian Elephant.*



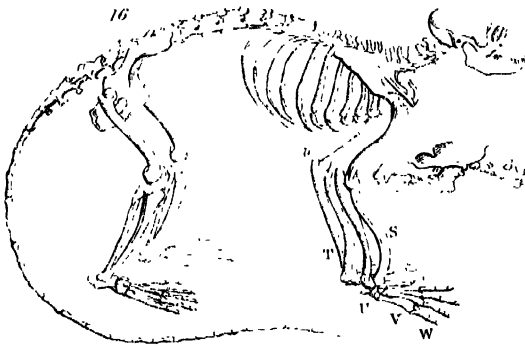
*Mastodon giganteus. Gigantic Mastodon.*



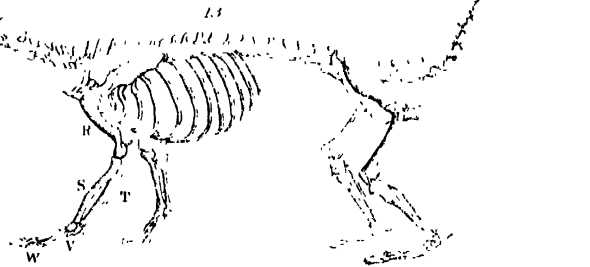




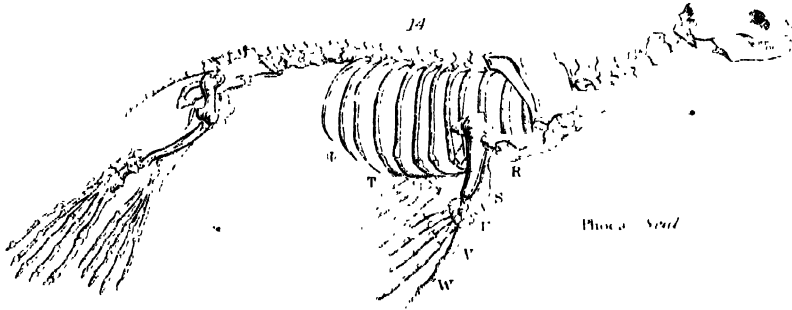
*Felis leo* Lion



*Somnopithecus maurus* Lohar



*Narua narica* Gale mende



*Phoca* Seal



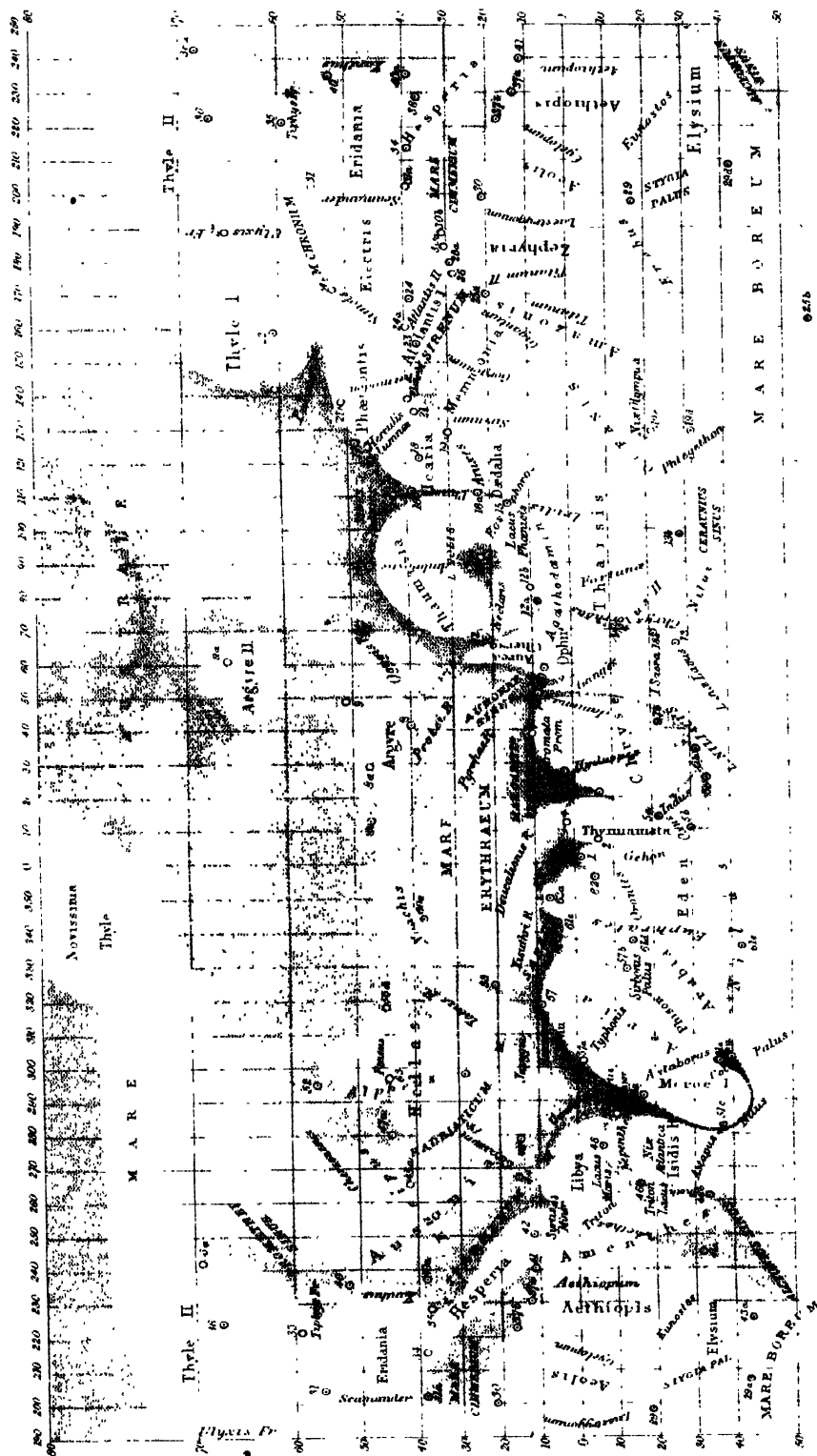
*Balena mysticetus* Greenland Whale







# SURFACE OF PLANET



Roses										anthers		ovules		servitas		
Wings	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330
180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340





*Hypsiprymnus murinus* Potoroo or Kangaroo Rat



*Macropus giganteus* Great Kangaroo



*Phascogaleus wombat* Wombat





4



*Didelphys virginiana* Virginian Opossum

5



*Phaenacomys glaberrimus* Meerkat like *Phaenacomys*

6

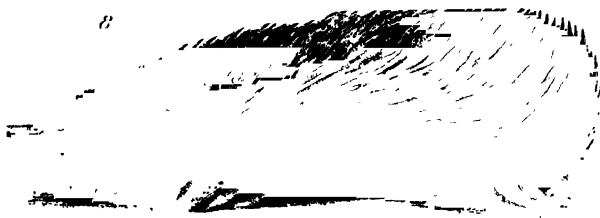


*Perameles obesula* Spiny Bandicoot





*Dasyurus viverrinus. Dasyure*

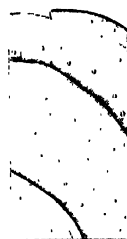


*Canina nysaria. Ant-eater*



*Ornithorhynchus anatinus. Duck-bill or Duck-billed Platypus*

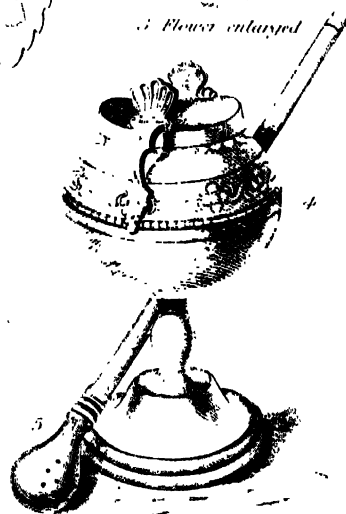




2. Portion of leaf enlarged



3. Flower enlarged

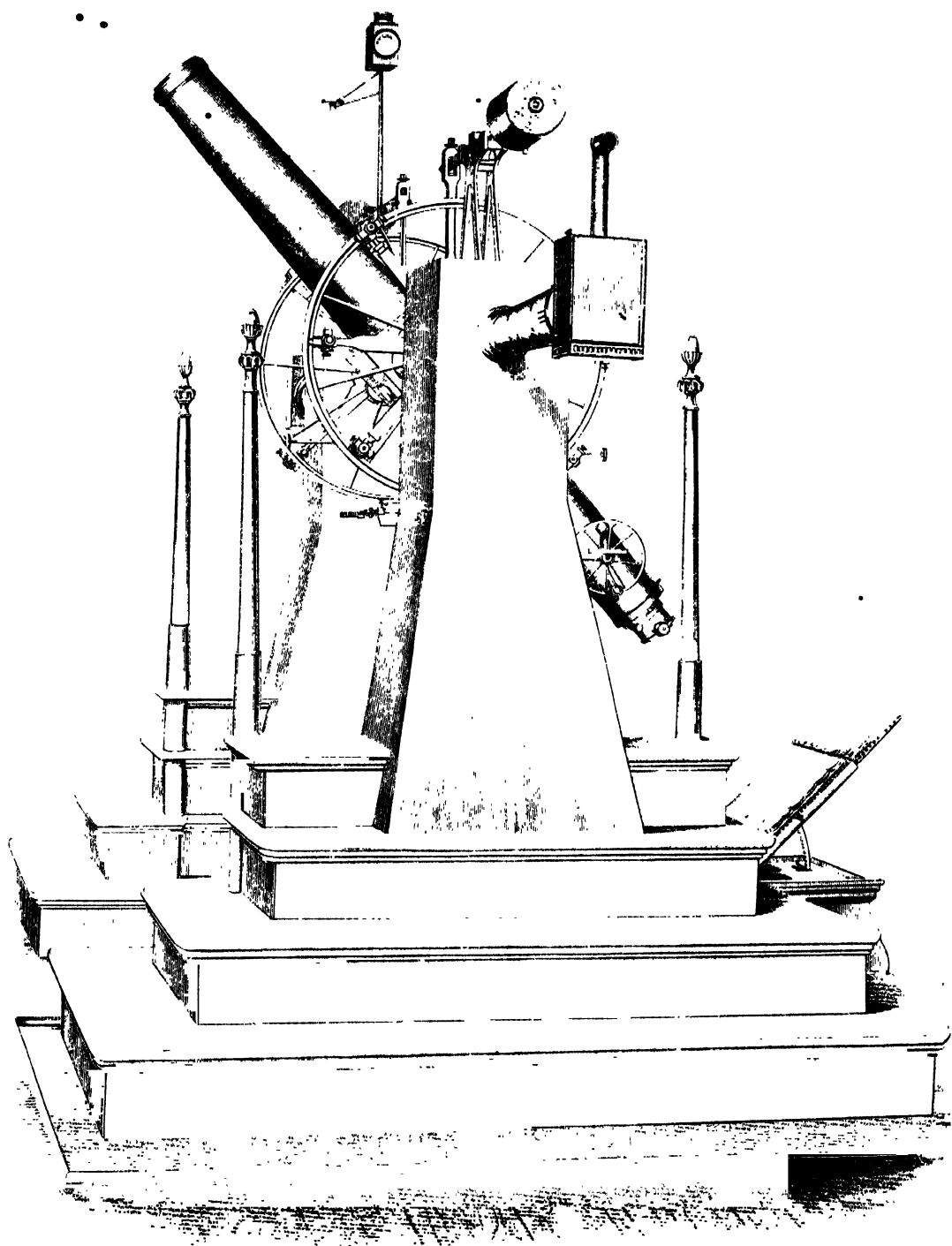


4. 5. Mate and Bombilla, two fifths of the natural size.

1. *Ilex Paraguayensis*



MERIDIAN CIRCLE



MERIDIAN CIRCLE AT LEYDE



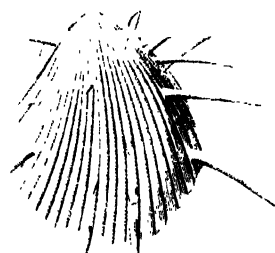




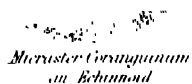
*Marupites Miller  
a. cronoid*



*Ammonites varians*



*Spondylus (Lima) Spinosus*



*Microstus Cerasatum  
an. Kichinoid*



*Scaphites*

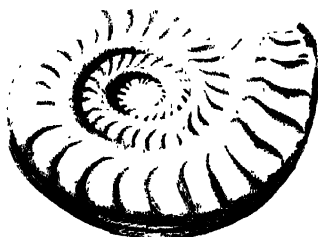


*Luceramus sulcatus*

C R E T A C E O U S



*Calanus intermedia*



*Ammonites Walcottii*



*Gryphaea incurva*



*Vertebra of Ichthyosaurus*



*Vertebra of Plesiosaurus*



*Trigonia costata*

J U R A S S I C



*A. Ganoid.*



*Pecten Vitor*



*Myophoria postera*

T R I A S S







# W E T E R O L O G Y

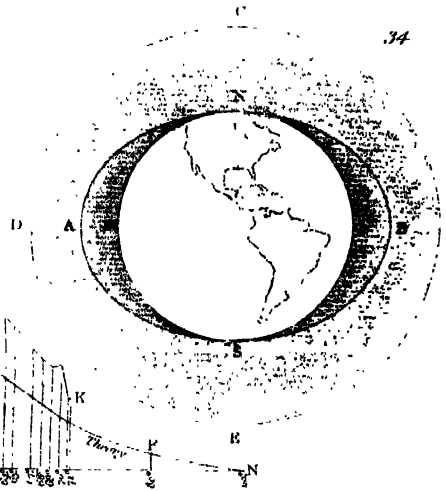
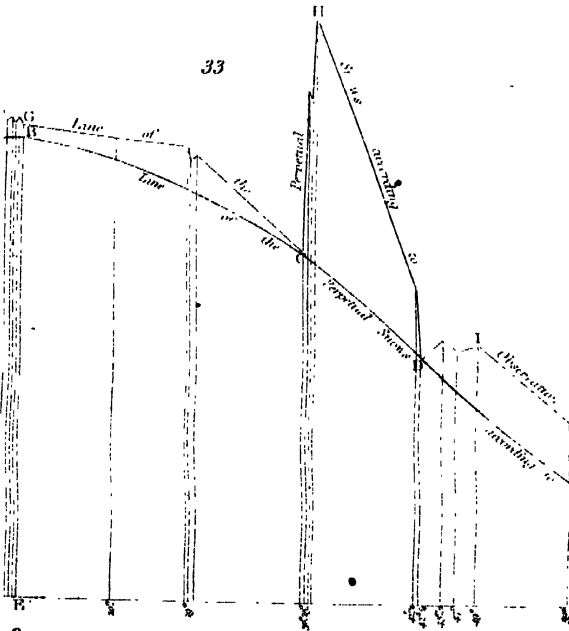
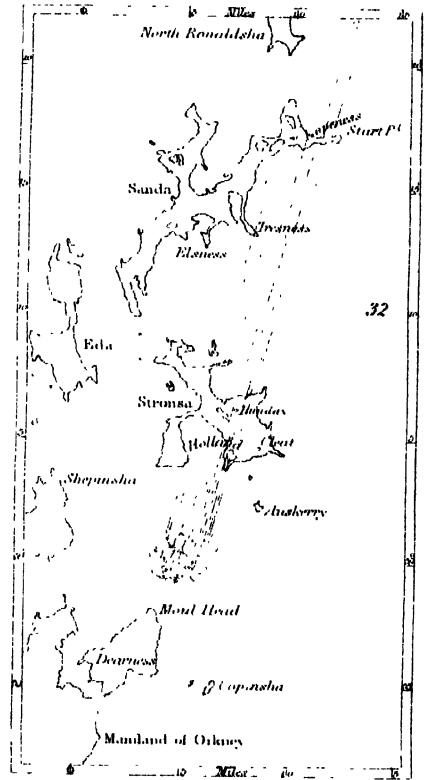
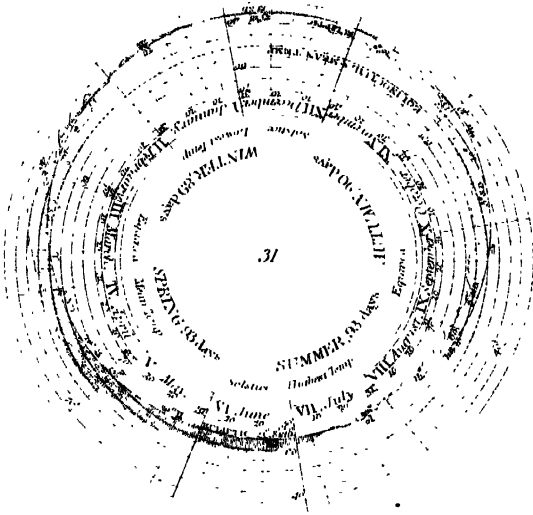
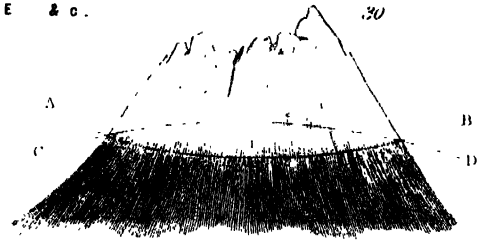
PLATE 2

EFFECTS OF SUNSHINE AND CLOUD—SHADOWS.





## SNOWLINE &c.



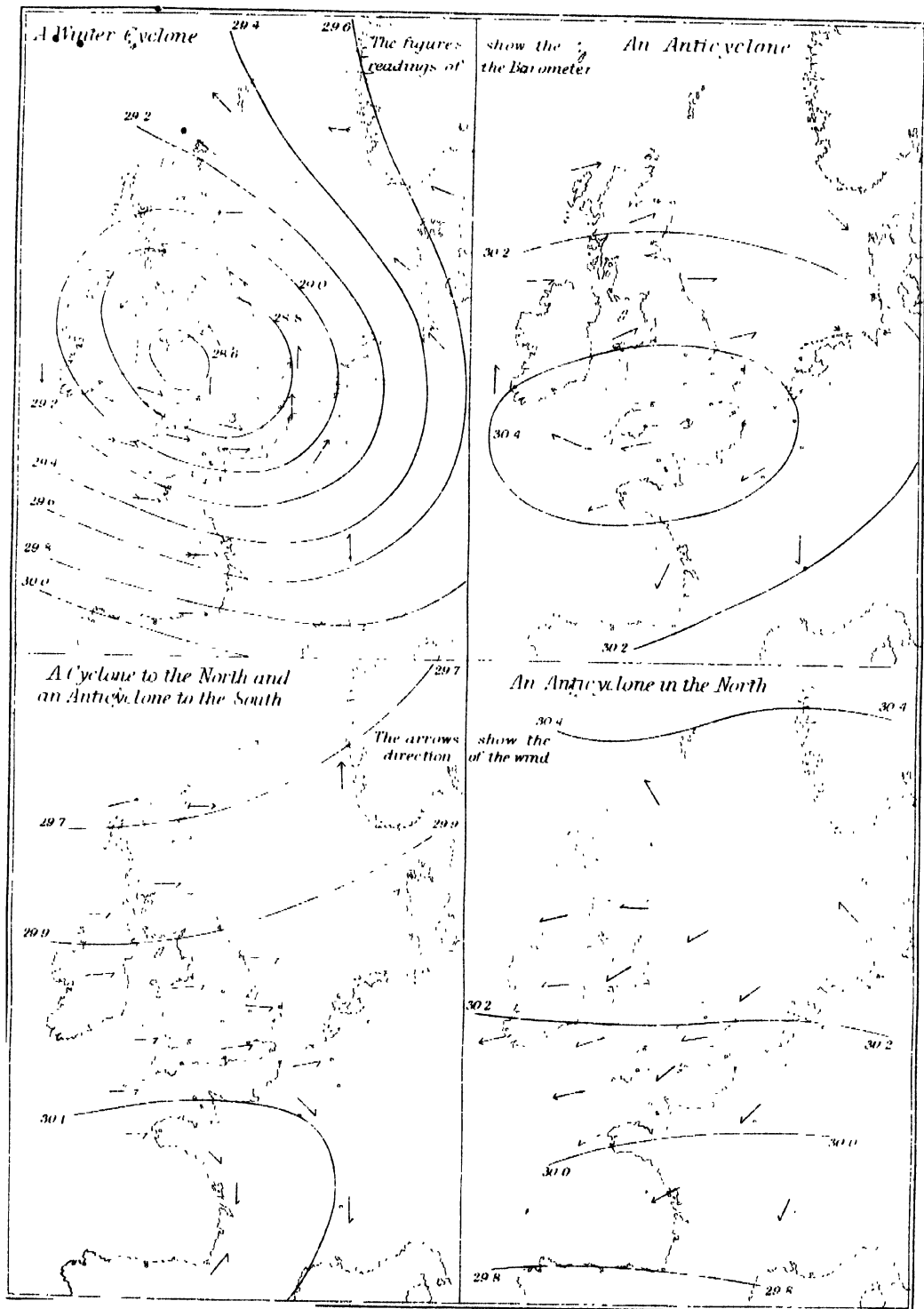




# METEOROLOGY.

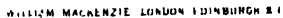
PLATE I

## CYCLONES AND ANTICYCLONES





MAP 1.





# M I N I N G .

• MAP 2.

## MAP OF the COAL FIELDS of NORTHUMBERLAND, CUMBERLAND AND DURHAM.

Abstract from the International Survey Maps  
on the "Romantic Map of England & Wales"

### EXPLANATION

- White Lias
- Iron measures
- Grey Limestone
- X & S. Sandals
- Millstone Grit
- Blue Limestone
- Permian
- Tertiary beds
- Silurian
- Granite &c.

English Miles

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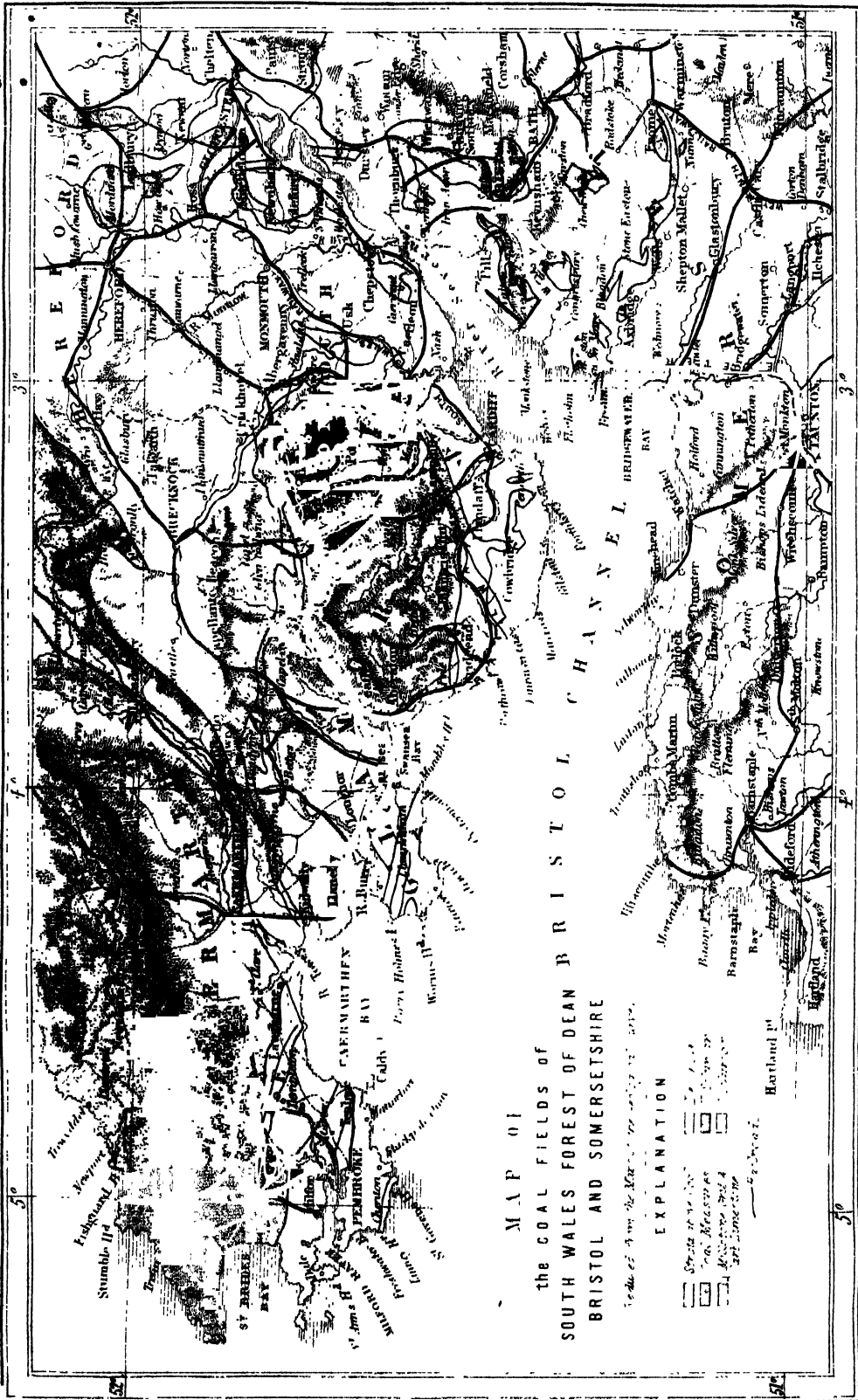




Fig. 1

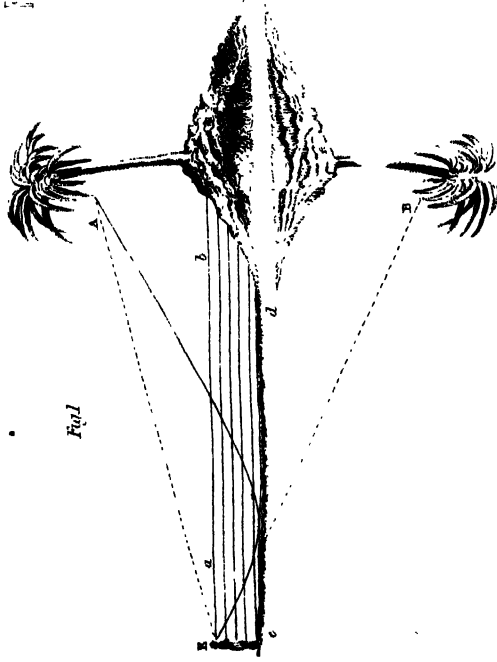


Fig. 2



Fig. 3

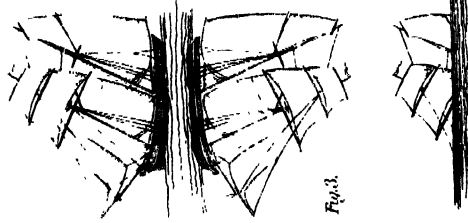


Fig. 4

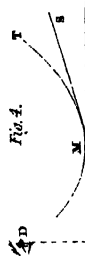


Fig. 10

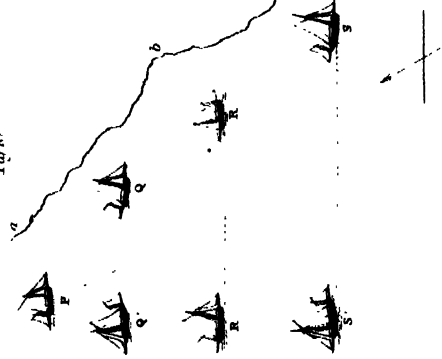


Fig. 9

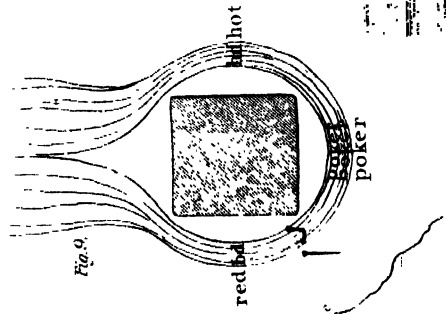


Fig. 5

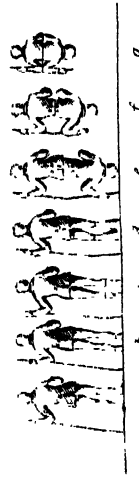


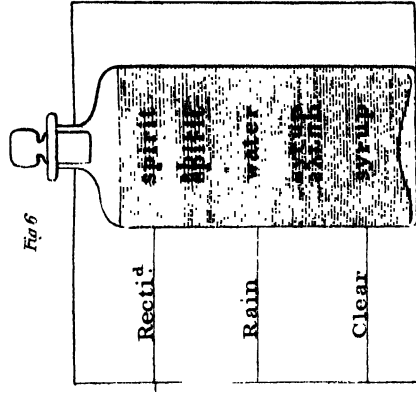
Fig. 7



Fig. 8

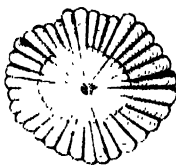


Fig. 6

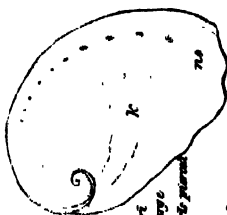




*Paediod Shell*

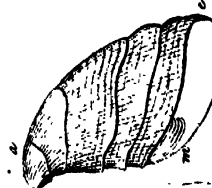


*Siphonaria.*

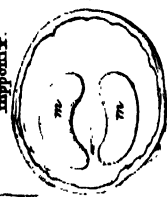


*Halotis*

*Last Whorl  
very large  
Body Whorl small*

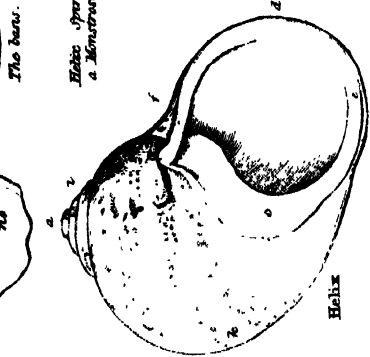


*Hyponix.*

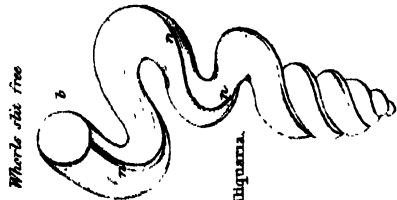


*The base.*

*Helix spurs unmarked  
a. Monstrously*



*Helix*



*Siliqua.*

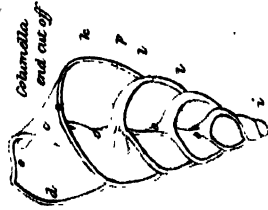


*Spire Whorls free*



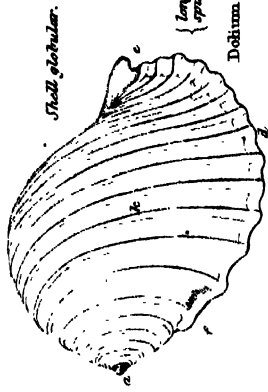
*Imp crura*

*Scaloria*



*Achatina*

*Columella  
and cut off*



*Shell globular.*

*Longitudinal or  
spiral ribs*

*Dohum.*

*Site of feature.*



*Pleurostoma.*

*expanded into  
a canal.*

*X.B. a. Summit or nucleus. b. Margin of mouth or Peristome. c. The inner or columella lip. d. Outer lip. e. Front edge. f. Border edge of mouth. g. The hollow axis or umbilicus. h. Spire. i. First whorl. k. Body whorl. l. Spire m. Muscular impression n. Longitudinal rib o. Columella. p. Dissepiment between the whorls.*

*X. The Parts of the various shells having the same number or letter are similar.*



# THE OPERCULA OF SHELLS



NB a. Swannit or nucleus. b. Margin of mouth or Peristome. c. The inner or columella lip. d. Outer lip. e. Front edge. f. Hind edge or mouth. g. The hollow area or umbilicus. h. Spine. i. First whorl. k. Body whorl. l. Suture in Molecular impression. m. Longitudinal rib. n. Columella.

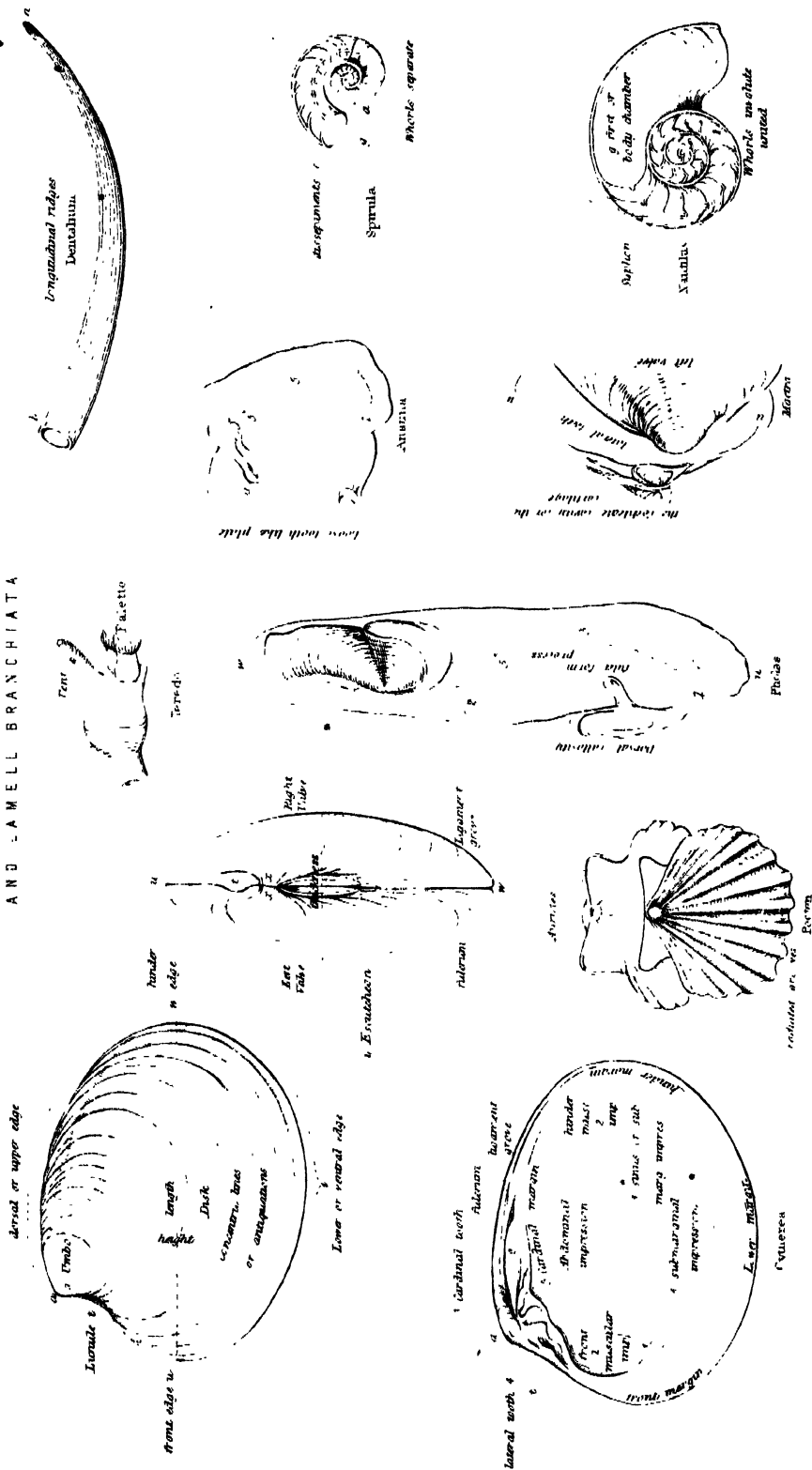
*B'. The Parts of the various shells having the same number or letter are similar*





# SCAPHOPODA CEPHALOPODA AND LAMELL BRANCHIATA

PLATE 3



15. A. Summit or nodule. B. Margin or mouth or Peristome. C. The inner or columella lip. D. Outer lip. E. Front edge. F. Inner side of mouth.  
 16. The hollow axis or umbilicus. 17. Spire. 18. For it where it joins in. 19. Muscular impression. 20. Longitudinal slit. 21. Columella.  
 22. Dissepiment between the whorls. 23. The part of the various shells having the same number or lower are similar.



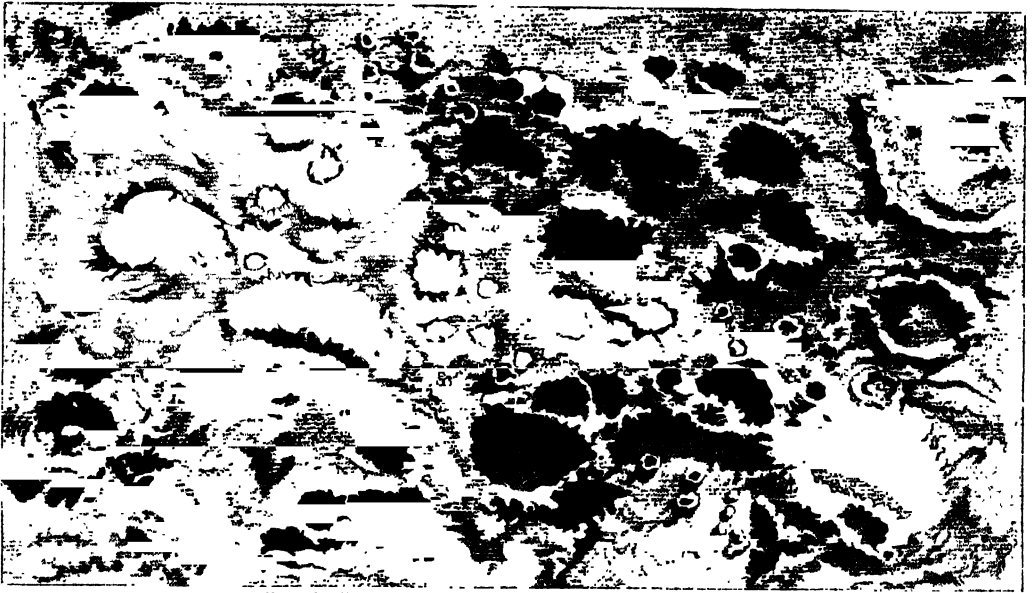


Fig. 1. Portion of the Moon's surface S. E. of Tycho

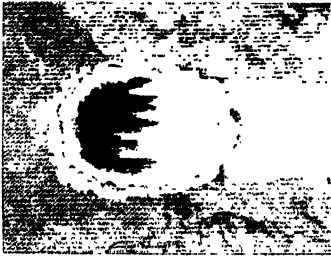


Fig. 2. Archimedes



Fig. 3. Pico

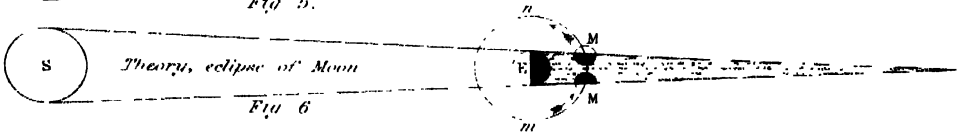
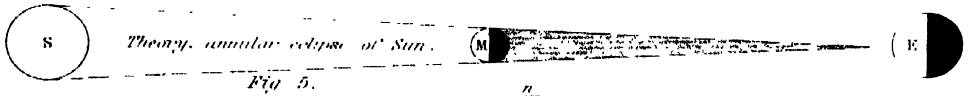
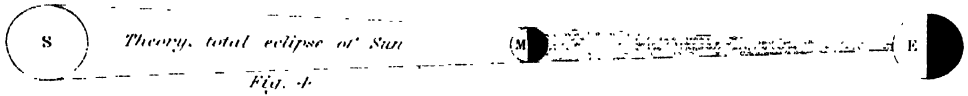
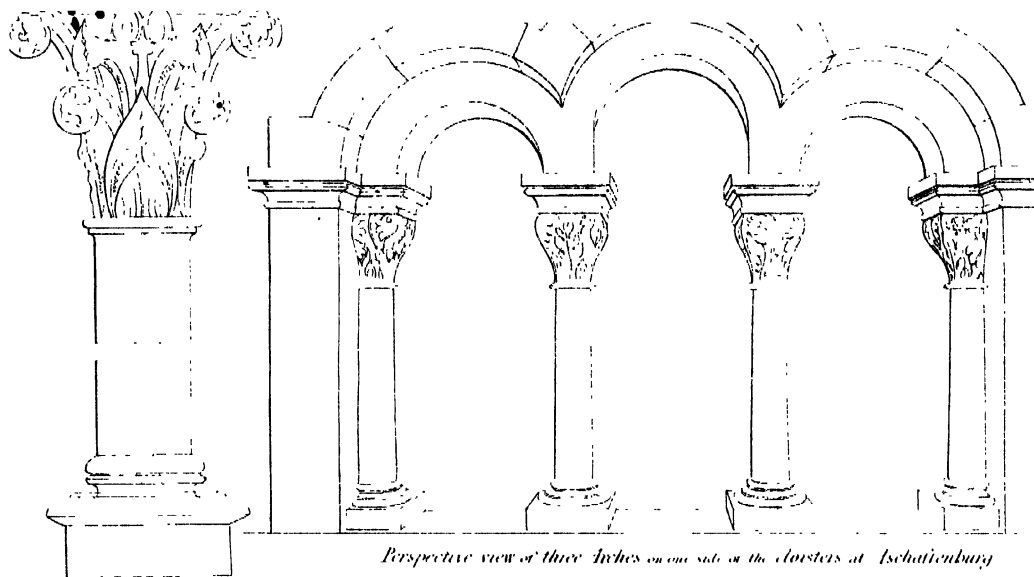


Fig. 7. Moon partially eclipsed

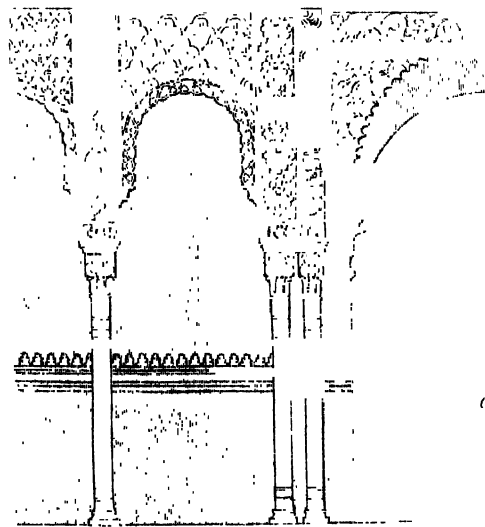


# MOORISH ARCHITECTURE.



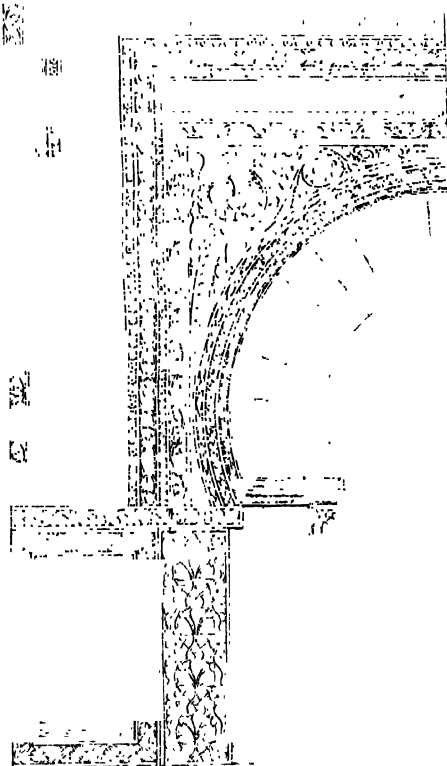
*Perspective view of three Arches on one side of the cloisters at Aschaffenburg*

*Column in the Church at Gelnhausen*



*Elevation of an Arch in the Court of the Lions Alhambra*

*Column in the Alhambra*



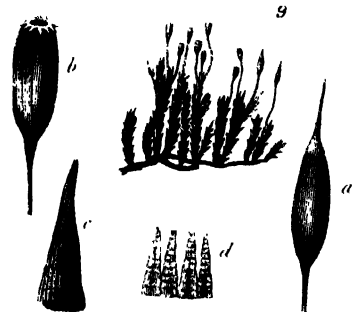
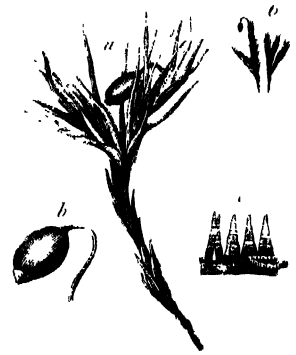
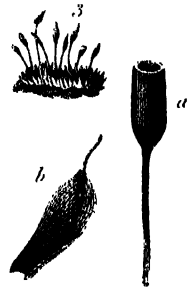
*Entrance to the Sanctuary of the Kôpin at Coylora*













OTHS.



1. *Attacus cyathia*—*Ailanthus Silk Worm Moth*.



*Eriogaster lanestris*—*Social Larva of the Small Eggier Moth*  
*Feeding on the Lime Tree.*

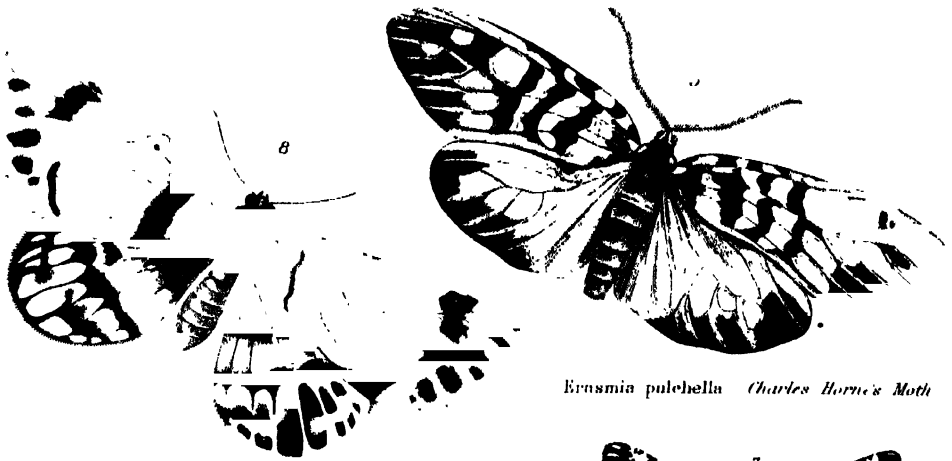


*Cnethocampa processionea*—*Processionary Moth*.



1. *Zenzera asculi*—*Larva of the*  
*Wood Leopard Moth.*





*Erasmia pulchella* Charles Horne's Moth

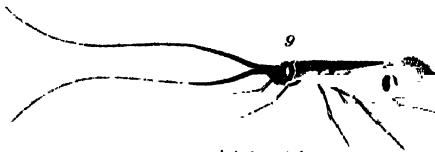
*Præsos Mariana* Marian White's Moth



*Eidonia atomaria*



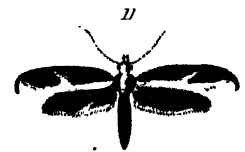
*Anesia sanguiflua* The Painter's puppet



*Adela Saltzella*



*Cerostoma xylestella*



*Grammia margaritella*

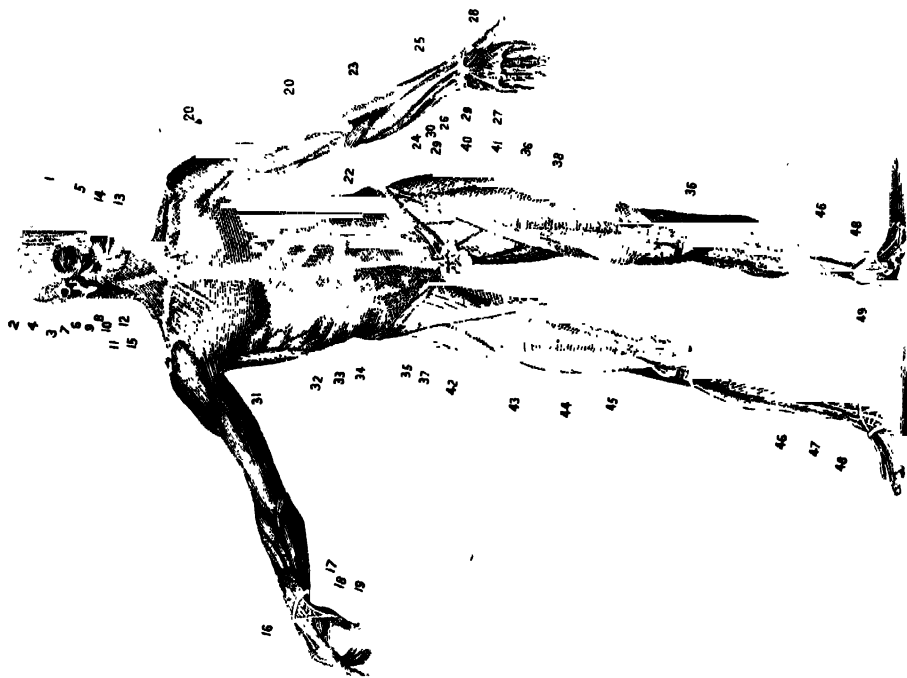


*Earis clorana*





Fig 1



Fig

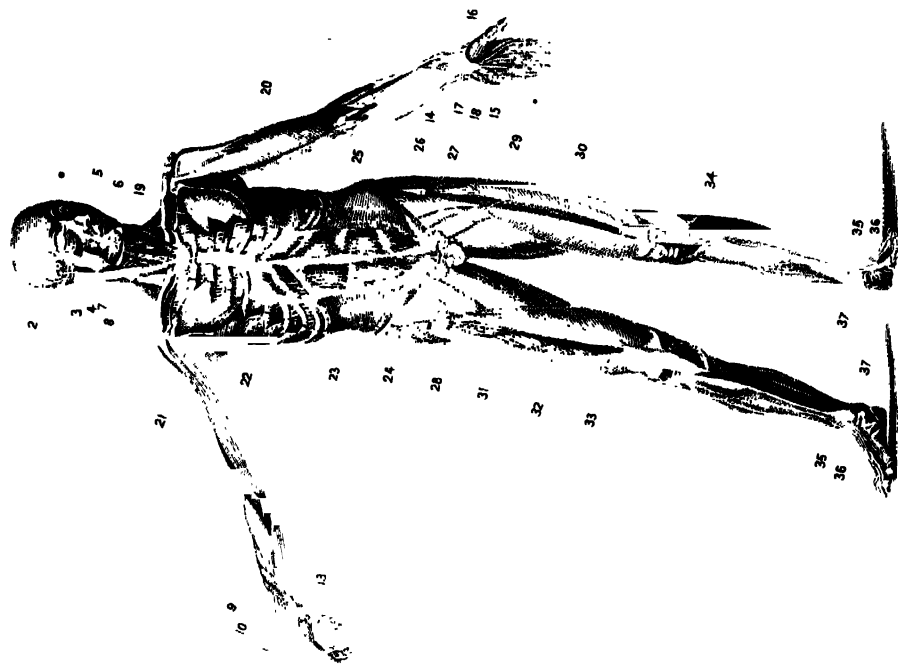






Fig 4



Fig 3

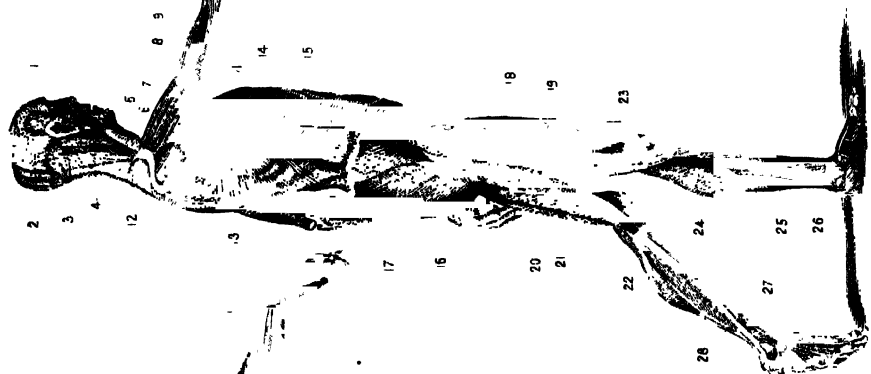


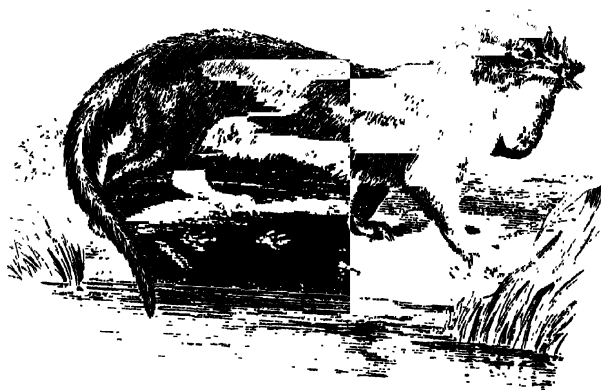
Fig 5







*Mustela martes. Pine Marten*



*Lutra vulgaris. Common Otter*



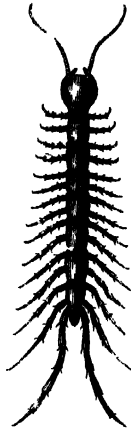
*Gulo luscus. Glutton or Wolverine.*



# MYRIAPODA.



1. *Scolopendrus complanatus*



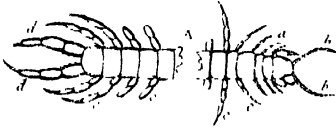
6. *Lithobius forficatus*



2. *Glomeris zonatus*



3. *Julus sabulosus*



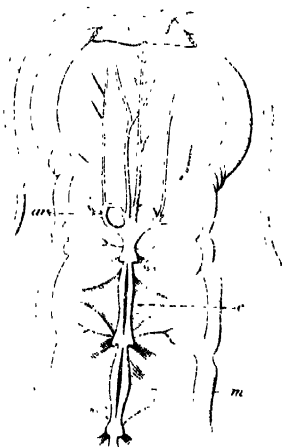
7. *Scolopendru morantina*



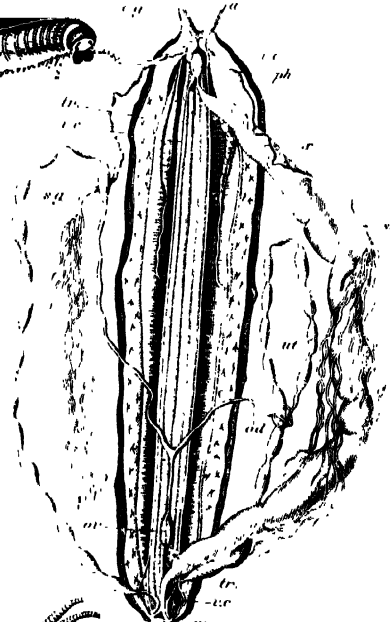
4. *Julus terrestris*



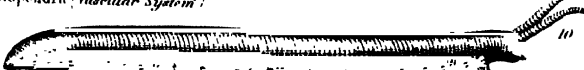
5. *Julus terrestris*



8. *Scolopendru (Vascular System)*



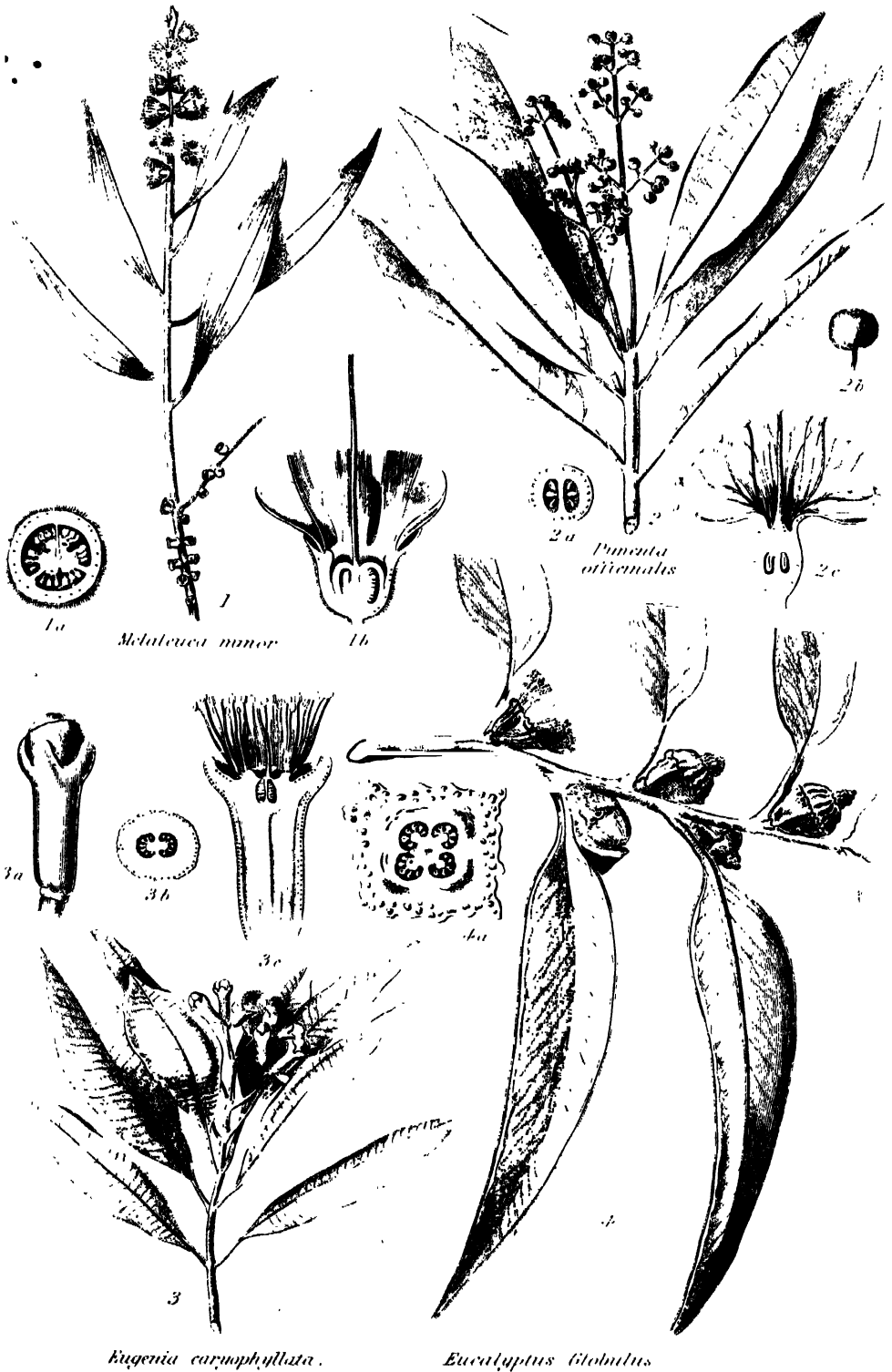
10. *Anatomy of Peripatus*



9. *Peripatus capensis*



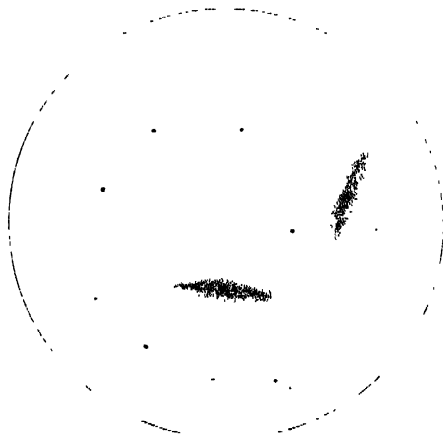
# MYRTACEAE.





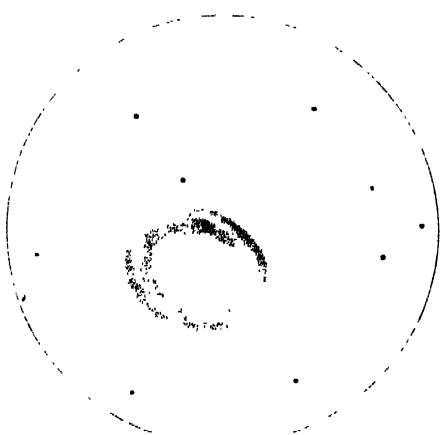


H 2054



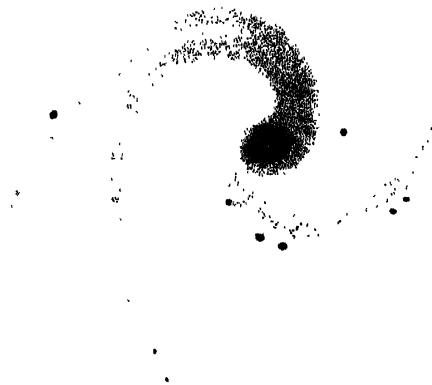
2 Double Nebula

H 2055



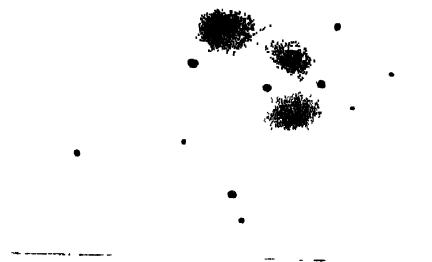
2 Double Nebula in Lyra.

H 2056



Spiral Nebula

H 2057



Elliptical Nebula

H 2058



Elliptical Nebula

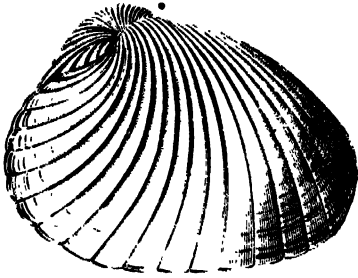
H 2059



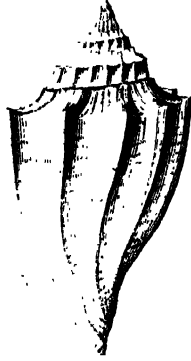
# NEOZOIC FOSSILS.



*Trochus*



*Venericardita*



*Voluta*



*Cypraea*



*Cytherea*



*Turbo*

*Helicostoma*



*Murex*



*Ammonites*



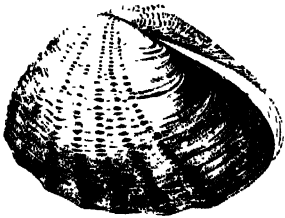
*Pecten*



*Trigonia*



*Mya*



*Pholadomya*



*Clupeus*





# NERVOUS SYSTEM

Fig. 1

- a Cerebrum.
- b Cerebellum.
- c c Spinal cord.
- d Facial nerve.
- e Brachial plexus.
- f Median nerve.
- g Ulnar nerve.
- h Cutaneous nerve.

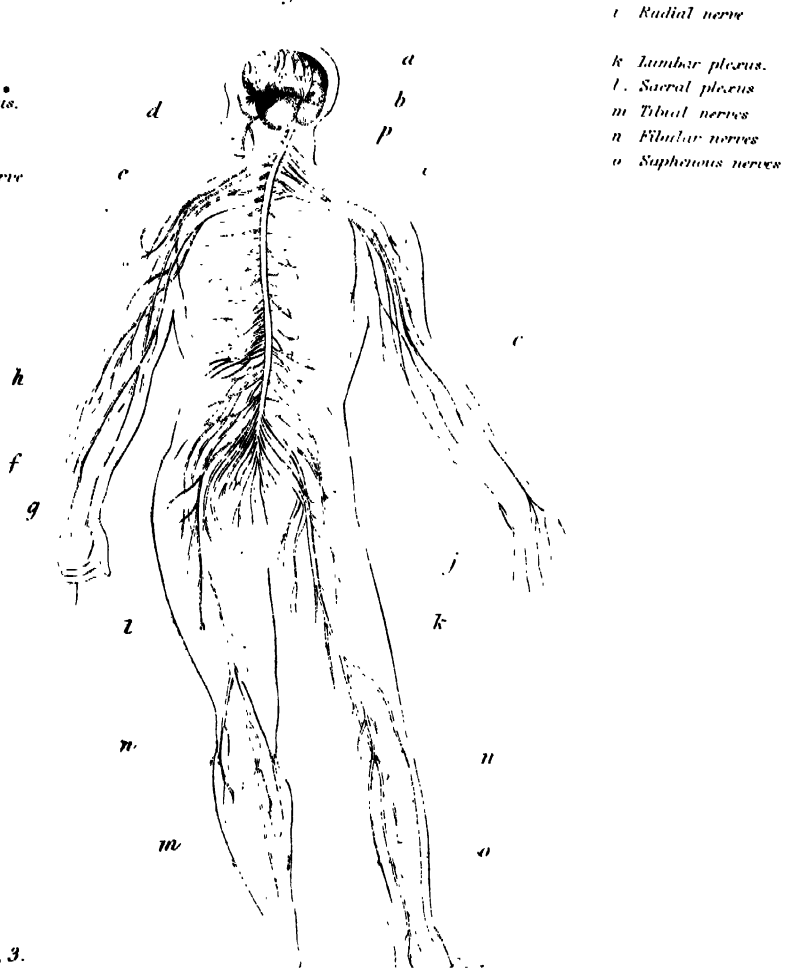
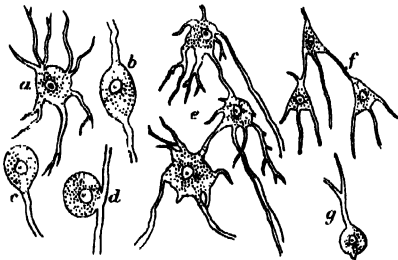
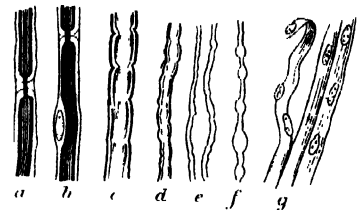


Fig. 3.



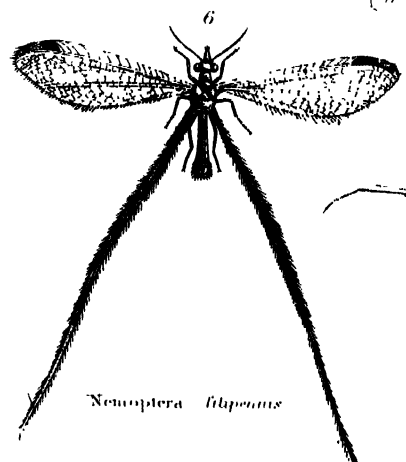
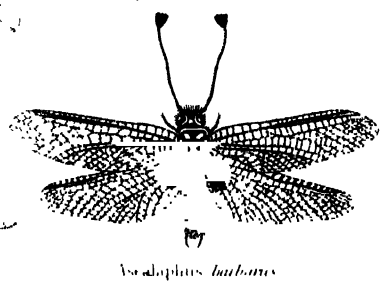
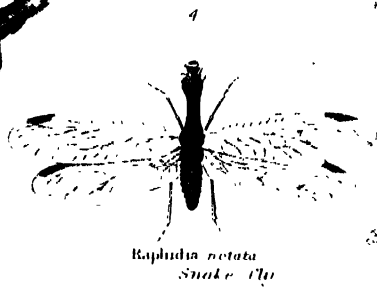
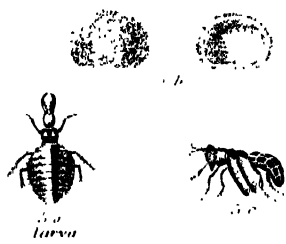
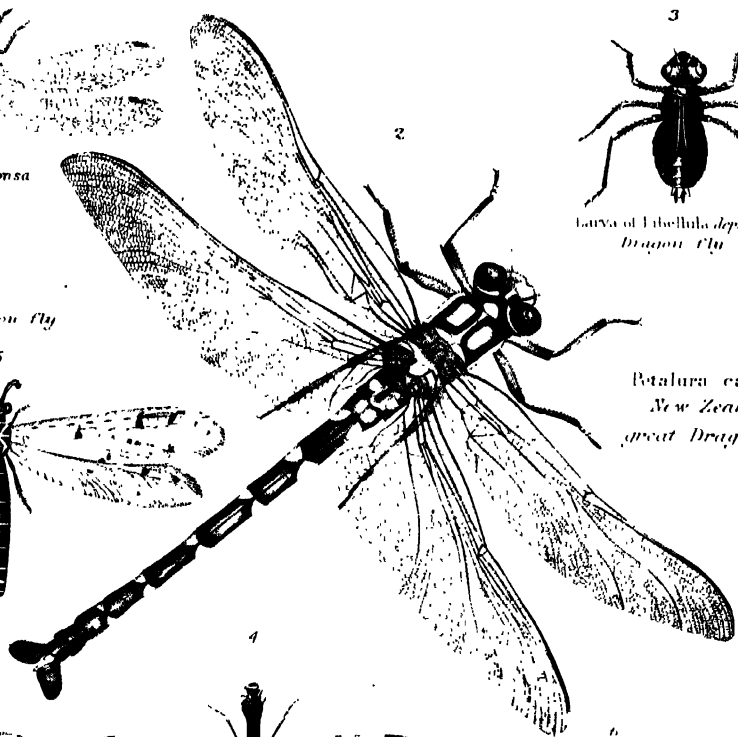
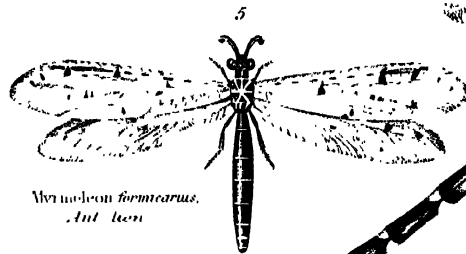
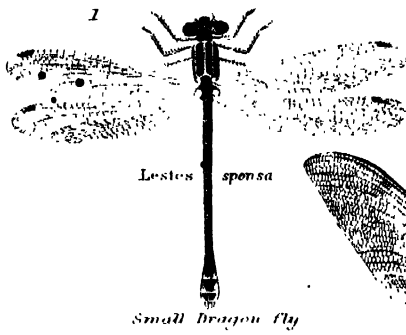
Various forms of nerve-cells—*a*, multipolar, from gray matter of spinal cord; *b*, bipolar, from ganglia on posterior roots of spinal nerves; *c*, *g*, unipolar, from cerebellum; *d* shows indications of a process coming off at lower end; *e*, union of three multipolar cells in spinal cord; *f*, union of three cells in gray matter of brain.



Nerves:—*a*, ordinary-sized nerve-tube, showing axis cylinder surrounded by white substance; *b*, smaller nerve-tube, with white substance scarcely visible; *c*, still smaller, with no white substance visible; *d*, varicose nerve-tube, from gray matter near surface of brain; *e*, nerve-tube, coloured by permanganic acid, showing one of the nodes of Ranvier, or complete interruption of the axis cylinder; *f*, nerve-tube showing nucleus and node of Ranvier (the axis cylinder is blackened by the action of the permanganic acid); *g*, non-medullated nerve-tubes from sympathetic, having no white substance, and nucleated at intervals.



# NEUROPTERA.

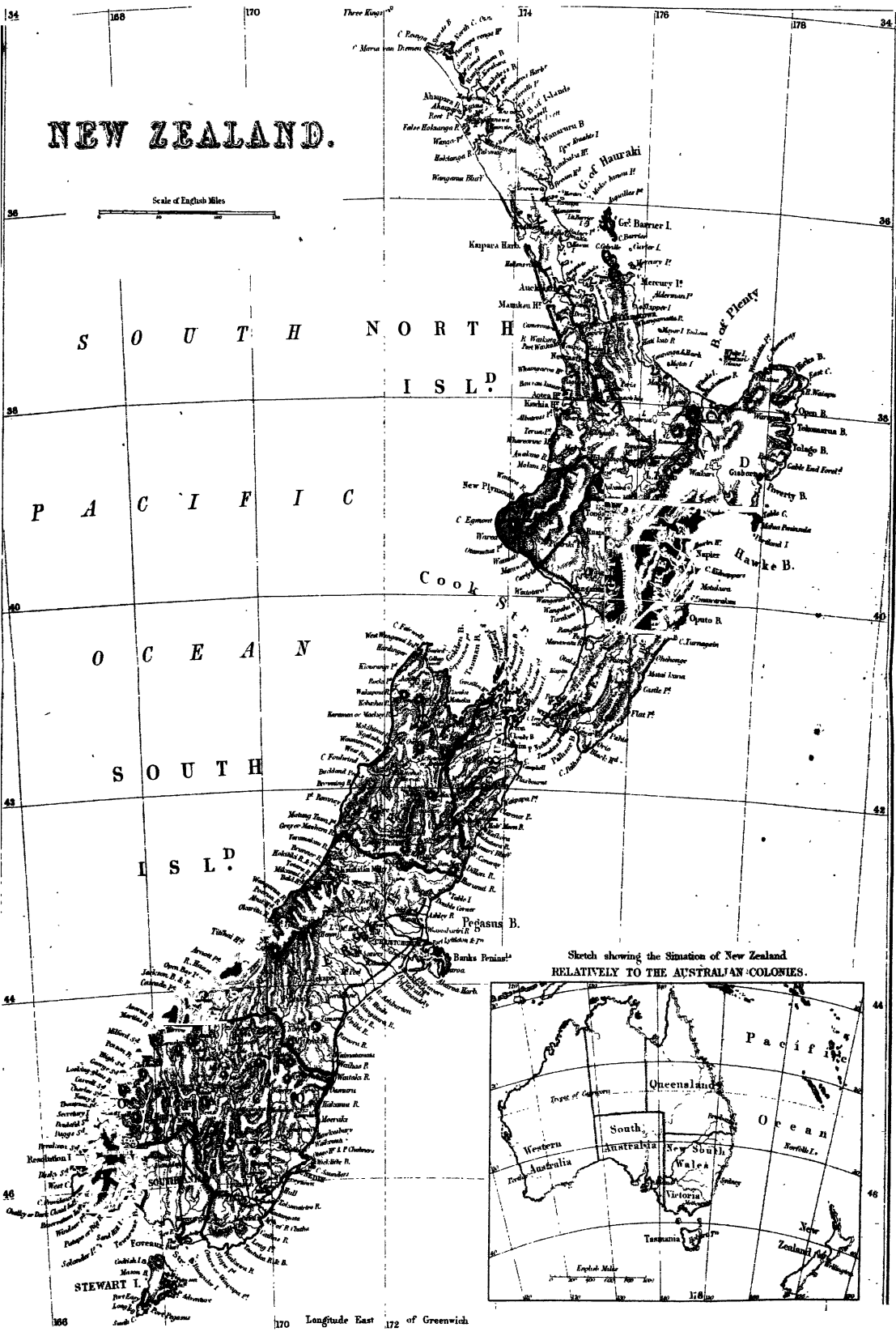


Order TRICHOPTERA.

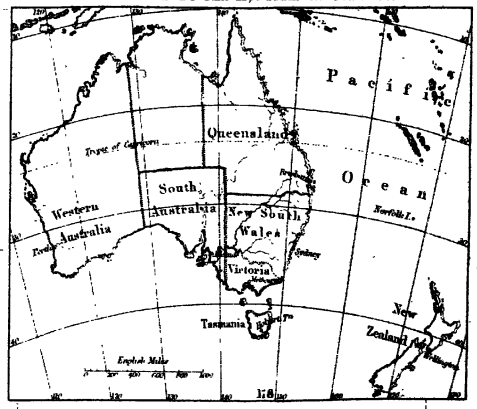








Sketch showing the Situation of New Zealand  
RELATIVELY TO THE AUSTRALIAN COLONIES.





# LIST OF PLATES.

## VOL. IX.

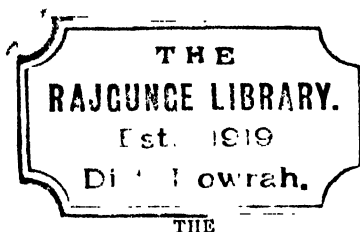
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*To be Bound at Commencement of Volume in Following Order.*

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MAMMALIA, . . . . .	„ I.-III.
MARANTA AND MANIHOT, . . . . .	„ I.
MARS, . . . . .	„ I.
MARSUPIALIA AND MONOTREMATA, . . . . .	„ I.-III.
MATÉ, . . . . .	„ I.
MERIDIAN CIRCLE, . . . . .	„ I.
MESOZOIC FOSSILS, . . . . .	„ I.
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MINING, . . . . .	COLOURED MAPS I.-IV.
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MOLLUSCA, . . . . .	„ I.-III.
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MYRTACEÆ, . . . . .	„ I.
NEBULÆ, . . . . .	„ I.
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NEUROPTERA, . . . . .	„ I.
NEW ZEALAND, . . . . .	COLOURED MAP.





# NATIONAL ENCYCLOPÆDIA: 10'S

## A DICTIONARY OF UNIVERSAL KNOWLEDGE.

### LUCIFER.

**LUCIFER** (*Luci fer*, the light-bringer, in Latin, and *Phosphoros*, its exact equivalent in Greek), the name among the ancients of Venus as a morning star; Noctifer, Hesperos, Vesper, &c., were her names as an evening star. Lucifer is also used as an epithet of several goddesses—Aurora, Diana, &c. In the classical mythology Lucifer or Phosphor was a son of the star-god Astræus and the dawn-goddess Aurora (Eôs), or, as some poets have it, of Kephalos and Eôs. He was held to be the father of the Hesperides. In mediæval times Lucifer came to be the original name of Satan, the embodiment of pride, the archangel who fell through ambition.

"I saw that one who was created noble  
More than all other creatures, down from heaven,  
Flaming with lightnings, fall upon one side."  
—*Dante, "Purg."* xii.

This probably arises from the passage in Isaiah (xiv. 12) where the prophet inveighs in a parable against Nebuchadnezzar, the earthly embodiment of pride in his day: "How art thou fallen from heaven, O Lucifer, son of the morning!" Milton uses Lucifer as the special pride-giving epithet of Satan, and in one fine passage couples the epithet with the star also—

"Know then, that after Lucifer from heav'n,  
So call him, brighter once amidst the host  
Of angels than that star the stars among,  
Fell with his flaming legions through the deep  
Into his place . . ."  
—*"Paradise Lost,"* vii. 131.

In Spenser's "*Fæerie Queene*" *Lucifera* is the goddess of pride, whose splendid house is built on sand.

**LUCIFER MATCHES.** See **MATCHES**.

**LUCIFUGA** is a genus of remarkable fishes inhabiting the subterranean waters of caves in Cuba. As these fishes never see the light, eyes are useless, and are therefore either absent altogether, or covered by the skin and quite rudimentary. The body is elongated and covered with minute scales. The median fin is continuous, running along the greater part of the back round to the vent. The ventral fins are mere filaments attached to the shoulder girdle. The barbels on the snout of its allies are replaced in *Lucifuga* by numerous minute cilia or tubercles. *Lucifuga* belongs to the family Ophidiidæ, of the order ANACANTHINI.

**LUCI'NA** is a genus of LAMELLIBRANCHIATA, a type of the family Lucinidæ. The shell is orbicular in shape, free and closed, and of a white colour. The umbones are depressed; the lunule distinct; the margins small or minutely crenulated. The animal has the mantle freely open below; the siphonal orifice simple; the mouth minute; the gills single on each side; and the foot, which is twice

### LUCKNOW.

as long as the animal, is cylindrical, pointed, and slightly hooked at the base. There are about seventy species. Their geographical range is wide; they are found on the coasts of Norway and of the West Indies and New Zealand. Two hundred and fifty species have been found fossil, commencing in the Upper Silurian. The species of the family Lucinidæ are numerous; they are chiefly natives of temperate and tropical seas, living upon sandy and muddy bottoms, and ranging from the sea-shore to great depths. The genera *Corbis*, *Kellia*, *Diplodonta*, and *Ungulina* are included in this family.

**LUCIUS** was the name borne by three popes.

**LUCIUS I.** Bishop of Rome, succeeded Cornelius, 25th September, 262, and was martyred at the hands of the pagans in March, 253.

**LUCIUS II. (Gerard)** succeeded Celestine II. 12th March, 1144. Immediately on his accession the people met on the capitol and declared the Roman republic re-established, and while professing obedience to the Pope in spiritual matters threw off their temporal allegiance, and elected a patrician or temporal governor. Resistance was overcome on every side, and the distressed Pope appealed for aid to the Emperor Conrad. As the emperor did not respond Lucius himself led the party of reaction, and was slain by a slinger's stone in attempting to storm the capitol, 25th February, 1145.

**LUCIUS III. (Ubaldo)** succeeded Alexander III., 1st September, 1181. Stormy Rome rose and drove him out in 1182, and again in 1183, with varied forms of insult. He held a council at Verona with the Emperor Barbarossa (Frederick I.). 1181, and died at Verona soon after its close, 25th November, 1185.

**LUCKNOW** (*Lakhnau*), the capital of the province of Oudh, British India, is situated on both banks of the river Gumti, and is distant from Cawnpore 42 miles, from Benares 199 miles, from Calcutta 610 miles. The population is 261,303. Though quite a modern town, Lucknow at present ranks fourth in size among Indian cities, being only surpassed by the three presidency capitals of Calcutta, Madras, and Bombay. It stands on an elevated plain, 403 feet above sea-level; and although destitute of any considerable trade or manufacture, still possesses very great wealth. Till recent years it formed the metropolis of a great Mohammedan kingdom, and afterwards contained the administrative headquarters of a considerable British province; while even at the present day it retains its position as a centre of modern Indian life, being the leading city of native fashion, and the chief school of Indian music, grammar, and Mussulman theology.

Lucknow stands on both banks of the Gumti, but the greater portion of the city stretches along its western side, a few suburbs only covering the further shore. Four bridges

span the river, two of them built by native rulers, and two since the British annexation in 1856. Viewed from a distance, Lucknow presents a picture of unusual magnificence and architectural splendour, which fades on nearer view into something more like the ordinary aspect of a crowded Oriental town. Nevertheless, many of its streets are broader and finer than those of most Indian towns; and the clearance effected for military purposes after the mutiny was instrumental in greatly improving both the aspect and the sanitary condition of the city. A glacis half a mile broad surrounds the fort; and three military roads, radiating from this point as a centre, cut right through the heart of the native quarter, often at an elevation of some 30 feet above the neighbouring streets. The Residency crowns a picturesque eminence, the chief ornament of the city.

Lucknow contains two noble mosques, one Imambara of imperial dimensions, four tombs of regal splendour (those of Saadat Ali Khan, of Mushid Zadi, of Mohammed Ali Shah, and of Ghazi-ud-din Haidar), together with two great palaces, or rather collections of palaces (the Chattr Manzil and the Kaiser Bagh). Besides these larger works, it also comprises a large number of royal garden houses, pavilions, town mansions, temples, and mosques. Since the annexation the nobility of Oudh have built a large number of town houses. They generally possess an imposing gateway as one main feature of the façade, consisting of arch within arch, rising from the same base, and covered with a modern Oriental profusion of gaudy colouring. Various charitable dispensaries, schools, and other works of public utility have also been built since the occupation of the city by the British.

Since the introduction of British rule, the new authorities have laid out well-kept roads, widened the tortuous native streets, and founded commodious bazaars, in which due attention has been paid to the comfort and convenience both of the commercial classes and their customers. The sanitary officers enforce stringent rules of cleanliness; and a municipality, containing many elective members, provides for the welfare of the city with a just regard to native feeling and wishes.

The traffic of Oudh flows southward from Bahramghat and Faizabad through Lucknow to Cawnpore. Large quantities of grain and timber come in from the trans-Gogra districts, while raw cotton, iron, and imported goods go northward in exchange. The Oudh and Rohilkhand Railway, with its branches, has a station in the town, and gives direct communication with Benares, Bareilly, and Cawnpore, besides connecting with the great trunk lines to Calcutta, Bombay, and the Punjab. Manufactures are carried on to a considerable extent, the chief products being those which call for the usual Oriental combination of patience, industry, minute manual skill, and delicate taste in the management of colour. Cotton muslins and other textile fabrics have a high reputation. Gold and silver brocade, however, made of small wires, forms the leading manufacture. It is used for the numerous purposes of Indian pomp, and has a considerable market even in Europe. The gorgeous needlework embroidery upon velvet and cotton, with gold thread and coloured silks, also employs many hands. Glass work and moulding in clay still maintain their original excellence. The railway workshops employ several hundred workmen.

The chief interest of Lucknow to British readers is its connection with the Sepoy Mutiny in 1857. Two months before the outbreak at Meerut, Sir Henry Lawrence (20th March, 1857) had assumed the chief-commissionership of the newly annexed province of Oudh. The garrison at Lucknow then consisted of the 32nd (British) Regiment, a weak company of European artillery, the 7th Regiment Native Light Cavalry, and the 13th, 48th, and 71st Regiments of native infantry. In or near the city were also quartered two regiments of irregular local infantry, to-

gether with one regiment of military police, one of Oudh irregular cavalry, and two batteries of native artillery. The town thus contained nearly ten Indian soldiers to every European, or 7000 to 750. Symptoms of disaffection occurred as early as the month of April, when the house of the surgeon to the 48th was burned down in revenge for a supposed insult to caste. Sir Henry Lawrence immediately took steps to meet the danger by fortifying the Residency and accumulating stores. On the 30th of April the men of the 7th Oudh Irregulars refused to bite their cartridges, on the ground that they had been greased with cow's fat. They were induced, with some difficulty, to return to their lines. On 3rd May Sir Henry Lawrence resolved to deprive the mutinous regiment of its arms, a step which was not effected without serious delay. On 12th May Sir Henry held a *darbar*, and made an impressive speech in Hindustani, in which he called upon the people to uphold the British government as most tolerant to Hindus and Mohammedans alike. Two days earlier the massacre at Meerut had taken place, and a telegram brought word of the event on the morning after the *darbar*. On the 19th Sir Henry Lawrence received the supreme military command in Oudh. He immediately fortified the Residency and the Machi Bhawan, bringing the ladies and children into the former building. On the night of the 30th May the expected insurrection broke out at Lucknow. The men of the 71st, with a few from the other regiments, began to burn the bungalows of their officers, and to murder the inmates. Prompt action was taken, and early next morning the European force attacked, dispersed, and followed up for 10 miles the retreating mutineers, who were joined during the action by the 7th Cavalry. The rebels fled towards Sitapur. Though the city thus remained in the hands of the British, by the 12th of June every other post in Oudh had fallen into the power of the mutineers. The chief-commissioner still held the cantonments and the two fortified posts at the beginning of June, but the symptoms of disaffection in the city and among the remaining native troops were unmistakable. In the midst of such a crisis Sir Henry Lawrence's health unhappily gave way. He delegated his authority to a council of five, presided over by Mr. Gubbins, the financial commissioner, but shortly after recovered sufficiently to resume the command. On the 11th June, however, the military police and native cavalry broke into open revolt, followed on the succeeding morning by the native infantry. On the 20th of June news of the fall of Cawnpore arrived; and on the 29th the enemy, 7000 strong, advanced upon Chinhat, a village on the Faizabad road, 8 miles from the Residency. Sir Henry Lawrence marched out and gave battle at that spot. The result proved disastrous to the British arms, through the treachery of the Oudh artillery, and a retreat became necessary. The troops fell back on Lucknow, abandoned the Machi Bhawan, and concentrated all their strength upon the Residency. The siege of the inclosure began upon 1st July. On the 2nd, as Sir Henry Lawrence lay on his bed, a shell entered the room, burst, and wounded him severely. He lingered till the morning of the 4th, and then died in great agony. Major Banks succeeded to the civil command, while the military authority devolved upon Brigadier Inglis. On 20th July the enemy made an unsuccessful assault. Next day Major Banks was shot, and the sole command was undertaken by Inglis. On the 10th of August the mutineers attempted a second assault, which was again unsuccessful. The third assault took place on the 18th; but the enemy were losing heart as they found the small garrison so able to withstand them, and the repulse proved comparatively easy. Meanwhile the British within were dwindling away and eagerly expecting reinforcements from Cawnpore. On 5th September news of the relieving force under Outram and Havelock reached the garrison by a faithful native messenger. On



22d September the relief arrived at the Alambagh, a walled garden on the Cawnpore road held by the enemy in force. Havelock stormed the Alambagh, and on the 25th fought his way with continuous opposition through the narrow lanes of the city. On the 26th he arrived at the gate of the Residency enclosure, and was welcomed by the gallant defenders within. General Neill fell during the action outside the walls. The sufferings of the besieged had been very great; but even after the first relief, it became clear that Lucknow could only be temporarily defended till the arrival of further reinforcements should allow the garrison to cut its way out. Outram, who had now re-assumed the command which he generously yielded to Havelock during the relief, accordingly fortified an enlarged area of the town, bringing many important outworks within the limits of defence; and the siege began once more till a second relieving party could set the besieged at liberty. Night and day the enemy kept up a continual firing against the British position, while Outram retaliated by frequent sorties. Throughout October the garrison continued its gallant defence, and a small party shut up in the Alambagh, and cut off unexpectedly from the main body, also contrived to hold good its dangerous post. Meanwhile Sir Colin Campbell's force had advanced from Cawnpore, and arrived at the Alambagh on the 10th of November. From the day of his landing at Calcutta, Sir Colin had never ceased in his endeavours to collect an army to relieve Lucknow, by gathering together the liberated Delhi field force and the fresh reinforcements from England. On the 12th the main body threw itself into the Alambagh, after a smart skirmish with the rebels. Sir Colin next occupied the Dilkusha Palace, south-east of the town, and then moved against the Martiniere, which the enemy had fortified with guns in position. After carrying that post he forded the canal, and on the 16th attacked the Sikandra Bagh, the chief rebel stronghold. The mutineers, driven to bay, fought desperately for their fortress, but before evening the whole place was in the hands of the British. As soon as Sir Colin Campbell reached the Moti Mahal, on the outskirts of the city proper, General Havelock came out from the Residency to meet him, and the second relief was successfully accomplished. Even now, however, it remained impossible to hold Lucknow, and Sir Colin Campbell determined, before undertaking any further offensive operations, to return to Cawnpore with his army, escorting the civilians, ladies, and children rescued from their long imprisonment in the Residency, with the view of forwarding them to Calcutta. On the morning of the 20th of November the troops received orders to march for the Alambagh; and the Residency, the scene of so long and stirring a defence, was abandoned for a while to the rebel army. Before the final departure Sir Henry Havelock died from an attack of dysentery. He was buried in the Alambagh, without any monument, a cross on a neighbouring tree alone marking for the time his last resting-place. Sir James Outram, with 3500 men, held the Alambagh until the commander-in-chief could return to recapture the capital. The rebels used the interval well for the fortification of their stronghold to the utmost extent of their knowledge and power. They surrounded the greater part of the city, for a circuit of 20 miles, with an external line of defences, extending from the Gumti to the canal. An earthen parapet lay behind the canal; a second line of earthworks connected the Moti Mahal, the Mess-house, and the Imambara; while the Kaisar Bagh constituted the rebel citadel. Stockade works and parapets closed every street, and loopholes in all the houses afforded an opportunity for defending the passage inch by inch. The computed strength of the insurgents amounted to 80,000 Sepoys, together with 50,000 volunteers; and they possessed 100 pieces of ordnance-guns and mortars. On the 2nd of March, 1858, Sir Colin Campbell found himself

free enough in the rear to march once more upon Lucknow. He first occupied the Dilkusha, and posted guns to command the Martiniere. On the 5th, Brigadier Franks arrived with 6000 men, half of them Gurkhas sent by the Rajah of Nepal. Outram's force then crossed the Gumti, and advanced from the direction of Faizabad (Fyzabad), while the main body attacked from the south-east. After a week's hard fighting, from the 9th to the 15th March, the rebels were completely defeated, and their posts captured one by one. Most of the insurgents, however, escaped. As soon as it became clear that Lucknow had been permanently recovered, and that the enemy as a combined body had ceased to exist, Sir Colin Campbell broke up the British Oudh army, and the work of re-organization began.

**LUCRETIA**, the name of a great patrician clan or *gens* of ancient Rome, and subsequently of a less famous plebeian *gens* also. The greatest Lucretius is the poet [see **LUCRETIVS**]; but one of the women of the family (who of course all bore the name Lucretia) lends it its greatest celebrity in story. Lucretia was the wife of Lucius Tarquinius Collatinus, who had unknowingly charmed the base Sextus Tarquinius, her husband's cousin, the son of Tarquinius Superbus, last king of Rome. This man arriving suddenly by night from the army, where he should have been engaged campaigning with her husband, forced Lucretia to dishonour, threatening her, if she did not submit, to lay a slave with his throat cut beside her and tell her husband he had caught and killed him there. Lucretia summoned her husband and his friends as soon as Sextus Tarquin had left her, declared the whole matter to them, swore them to vengeance, and then stabbed herself, as unfit longer to survive her shame. Thus began the great revolution which destroyed for ever kingdom in ancient Rome, and established in its stead the most powerful republic the world ever saw.

**LUCRETIVS**, with his full name **TITUS LUCRETIVS CARUS**, was born B.C. 95, and is said, on unsatisfactory evidence (or rather on none at all, but the bare assertion), to have died by his own hand, driven mad by a love potion administered by his wife K.C. 52, in the forty-fourth year of his age. The poem of Lucretius entitled "*De Rerum Natura*" (On the Nature of Things), in six books, contains a development of the physical and ethical doctrines of Epicurus. Notwithstanding the apparently unpromising nature of his subject, there is no writer in whom the Latin language displays its majesty and stately grandeur so effectively as in Lucretius, who amply proves, in his own person, that poetry is not incompatible with science, and that it is possible for a man to investigate the laws of nature without blinding his vision to the loveliness of the ideal world. Add to this, that the passionate fervour of the poet's revolt against a creed as cruel as it was superstitious finds an echo in many despairing souls of our own age, and we have all the elements of the powerful fascination which Lucretius exercises over the minds of to-day. The primary aim of the poet was a law of life, and philosophical theories only served as the means of exposition. Nevertheless the early statement of the atomic theory is remarkable in Lucretius. It forms the subject of one of the latest contributions to the Lucretian criticism, "*The Atomic Theory of Lucretius*," by John Massou (London, 1884). The English translations of Lucretius which are most worthy of notice are by Creech (1714) and by Mason Good (1805), and the English prose edition by the Rev. J. S. Watson, M.A. (1851); and there is an excellent general account of the poet's aims and works by Mr. Malloch in the *Ancient Classics Series* (London, 1878).

**LUCULLUS, LUCIUS LUCINIVS**, descended from a distinguished Roman family, was born about B.C. 115, and served under Sulla in the Marsian war. While Sulla was besieging Athens (B.C. 87), Lucullus was sent

into Egypt and Africa to collect a fleet; and after the conclusion of the war with Mithradates, he was left in Asia to collect the money which Sulla had imposed upon the conquered states. In B.C. 74 he was elected consul, and appointed to the command in the war against Mithradates. During the following eight years, and in a series of brilliant campaigns, he completely defeated Mithradates and his son-in-law Tigranes. Lucullus never appears to have been a favourite with his troops; and their disaffection was increased by the acts of Clodius, whose sister he had married. He was consequently removed, and succeeded by Pompey, B.C. 66. Lucullus then returned to Rome, and with the vast wealth amassed in Asia gratified his inordinate love of luxury till his death in B.C. 56. His gardens and banquets are proverbial. At his Naples estate he laid out vast sums, cutting through hills and rocks, throwing out piers into the sea, constructing parks and fish-ponds, &c. He invented new dishes and acclimatized new fruits. Thus he introduced the cherry into Europe from Cerasus in Pontus, whence its name. Some of his favourite trees were nourished with wine. His house in Rome was filled with the treasures of Greek art, and was thrown open to the public on frequent show days. Lucullus was no glutton, though his taste in cookery was excellent and his expenditure fabulous, nor was he ungenerous though so ardent a collector. His fondness for natural beauty is a pleasing trait, and his freedom from grossness or selfishness prevents his luxury from inspiring condemnation.

**LUCUMA** is a genus of plants belonging to the order SAPOTACEÆ. It is chiefly remarkable for the species *Lucuma mammosa*, which is cultivated in the West Indies and tropical America for the sake of its fruits. These are 4 or 5 inches long, and contain usually a single seed imbedded in a thick pulp, which is very agreeable to the taste, and has been compared to quince marmalade. On this account the fruit is called Natural Marmalade. The Caimito fruit of Peru is produced by *Lucuma Caimito*; it is smaller, and of a finer flavour. The species (about fifty in number) are chiefly natives of South America, but extend northwards into Mexico and the West Indies; a very few are found in Australia and New Caledonia. They are trees or shrubs with milky juice, leathery leaves, and flowers crowded in the axils and growing on very short stalks.

**LUD'DITES**, a name given to bands of workmen who had a strong aversion to the introduction of machinery. They were most numerous in the years 1812-17, during which period they resorted to riots and many other kinds of violence, in the hope of intimidating employers. The name was derived from Ned Lud, an idiot, whose chief peculiarity was a strong propensity for breaking machinery.

**LUD'LOW**, a municipal borough of England, in the county of Salop, and a station on the Shrewsbury and Hereford Railway, 23 miles S. by E. from Shrewsbury, and 167½ from London. The streets are broad, well paved, and the houses in general well built. Of late years great improvements have been made, an effective system of drainage has been carried out, and water-works erected—providing an ample supply from springs outside the town. The town is said to be the *Dinas* of the British and the *Leadlowe* of the Saxons, and is situated on a hill in a healthy spot, near a bend of the river Temse, where the Corve joins it. There are two bridges across the stream. Near the summit of the hill are the keep (110 feet high) and other picturesque remains of Roger Montgomery's Norman castle, which was the seat of the lords president of Wales from the reign of Henry VIII. to 1689. It commands an extensive prospect. Parts of the old town walls also remain. The principal public buildings are:—St. Lawrence's cruciform church, 228 feet long, with a tower 130 feet high, built by Henry VII. and thoroughly restored in 1863; Independent Wesleyan and Primitive Methodist chapels; town-hall and

market-house, at the end of the main street; guildhall; prison; house of correction; savings bank; theatre; assembly rooms; literary institution; Natural History Society's museum of fossils, &c.; Edward VI.'s free grammar-school (1552); blue-coat school, over the market cross; Hosyer's and Foxe's almshouses; dispensary; two banks, &c. Ludlow has a trade in malt, and some corn, paper, and other mills. Trout, perch, and roach abound in both rivers. The borough had a population of 5035 in 1881. The town is governed by four aldermen and twelve councillors. Ludlow returned two members to the House of Commons from 1473 to 1868, and one from 1868 to 1885. Milton's "Comus" was first performed at Ludlow Castle, by the family of Lord President Brackley, the incident of the poem having been suggested by the loss of the daughter of the Earl of Bridgewater for a night in the forest. Henry VII.'s son Arthur was married to Catharine of Aragon here, and afterwards kept his court at the castle, where he died.

**LUD'LOW BEDS** form the uppermost member of the Upper Silurian. They succeed the Wenlock group (with which they have many affinities), and pass upwards without serious stratigraphical break into the Old Red Sandstone formation. They form a well-marked series of beds, about 2000 feet thick. They are separated into lower and upper divisions, between which there is a variable band of limestone—the Aymestry limestone. Like the Wenlock group of rocks, these beds consist largely of argillaceous shale; there is also a close relation in the faunas of the two groups, many species being common to both, especially those found in the limestones.

The *Lower Ludlow Rock* consists mostly of brown sandy shales and mudstones, with some local calcareous beds; towards the top it is somewhat flaggy. Fossils are plentiful; trilobites appear to be on the decline in numbers, and are replaced in a measure by the phyllopois. The brachiopods are mostly of Wenlock forms. Representatives of the orthoceratites are plentiful; these, with the curved form phragmoceras and litulites, form one of the peculiar features of these rocks. The first representative of vertebrate life appears in the Lower Ludlow; it is the remains of a fish, *Scaphaspis (Pteraspis) ludensis*, allied to the modern sturgeon. This interesting fossil was found at Laintwardine associated with typical Lower Ludlow fossil forms.

The *Aymestry Limestone*, or middle division of the Ludlow formation, is a narrow band of earthy limestone of variable occurrence, but seldom exceeding about 6 feet in thickness; in many sections it is altogether absent, the Upper and Lower Ludlow then coming together and forming a thick series of argillaceous beds, that pass into the argillaceous series of the Wenlock, where the Wenlock limestone is absent. The organic remains of the Aymestry limestone are not peculiar, they are mostly of species found in the Wenlock. The most characteristic fossil is *Pentameris knightii*.

The *Upper Ludlow Rock* has almost the same lithological characters as the lower division, but it bears some indications of having been deposited in a shallower sea, especially its upper beds, which pass by a series of easy gradations through the tilestones into the overlying Old Red Sandstone formation. One of the most remarkable features of the Upper Ludlow is the Ludlow Bone Bed, a comparatively insignificant layer, not more than a few inches in thickness, but of very constant occurrence over a large area, and containing a considerable number of vertebrate remains. These consist chiefly of fragments of fish, represented by bones, teeth, shagreen-like scales, plates, and spines. Another remarkable feature of the Upper Ludlow is that among the uppermost beds, near May Hill, the remains of land plants have been found; these consist of twigs and the spore-cases of a leycopod, *Pachytheca spherica*. The other fossil remains are mostly similar to

these of the lower beds, and many of them are Wenlock species. The trilobites have declined considerably, but the orthoceratites have increased both in number and size.

On approaching the top of the Ludlow rock, Silurian forms of life gradually die out, and in the typical Silurian area of South Wales the beds assume the general character of the overlying Old Red Sandstone. In most other districts where the Upper Silurians are developed, the several subdivisions are not so clearly defined, but the rocks have been more altered, and there is a well-marked break between them and the overlying Old Red Sandstone, which rests on their upturned and denuded edges.

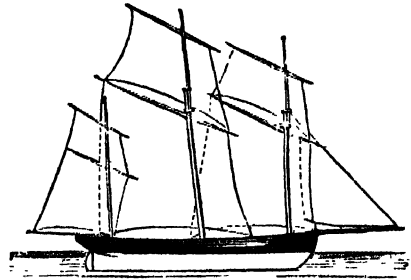
**LUFF**, a nautical term: the order to the helmsman to put the tiller towards the lee side of the ship, in order to make her sail nearer to the wind. A ship is said to spring her luff when she obeys the helm.

**LUGA'NO**, one of the chief towns in the canton of Tessin, Switzerland, is a pretty, thriving place on the north-west bank of the Lake of Lugano, 86 miles N.N.W. of Milan. It is thoroughly Italian in character, with dirty arcaded streets; but it has some fine churches, and large mansions, an hospital, theatre, college, manufactories of silk, paper, tobacco, and leather, iron and copper foundries, and 7000 inhabitants. It is an entrepôt of the trade between Italy and Switzerland. During the Italian struggle against the Austrians it formed a convenient centre for the agitation of Mazzini and his fellow-patriots. The vicinity is planted with vines, olives, and other southern trees, and abounds with country-houses and grottoes.

**LUGA'NO**, the ancient *Lacus Ceresius*, is a lake of North Italy, partly in the canton of Tessin, and partly in Lombardy, between the Lakes Como and Maggiore, into the latter of which it sends its surplus waters by the river Tresa. It has an elevation of about 200 feet above these lakes, or 900 feet above the level of the sea. Its length from N.N.E. to S.S.W. is 16 miles; its greatest breadth, 2 miles. The shape, however, is very irregular. The shores are lofty, abrupt, and richly wooded, and the scenery of a more solemn character than the sister lakes. The depth varies from over 1000 feet to a depth, near Bissone,

shallow enough for a stone railway dyke to be carried across. It is navigated by steamers. One of the mountains, San Salvador, on a promontory washed on two of its sides by the lake, rising to the height of nearly 2000 feet above the level, is a sublime object from the lake, and commands from its summit a most magnificent and varied prospect. In some parts, however, the banks of the lake slope gently down to the water's edge, and are covered with villages, vineyards, and gardens. The Bay of Lugano, on its western side, with its surrounding amphitheatre of hills, is particularly fine. Its waters are quite transparent.

**LUGGER**, a vessel which carries a lug-sail on each of its masts, and occasionally a topsail. The lug-sail is of a



quadrilateral shape, and is bent by the upper side upon a straight yard, which is slung on the mast in an oblique position, one-third being to the windward and two-thirds to the leeward side of the mast. Luggers, in England, scarcely ever exceed large fishing vessels in size, but in the French navy ships as large as British schooners are often lugger-rigged. The form of the sail enables them to beat close to the wind.

**LUG-WORM** or **LOB-WORM** (*Arenicola piscatorum*) is a worm belonging to the order *TUBICOLÆ*. The lug-worm is well known on British coasts, burrowing in the sand or mud near low-water mark. The body is



*Arenicola piscatorum*, or Lug-worm.

long and cylindrical, attaining a length of about 10 inches. The segments of which it is made up are subdivided into a number of superficial rings. The *prostomium* or lobe in front of the mouth is very minute, and the most anterior segments are devoid of bristles and can be telescoped. The succeeding segments are provided with bristles, and about twelve or thirteen segments in the middle of the body carry branchial tufts, which are spread out in a beautiful arborescent form and supplied with bloodvessels. These branchial tufts are red or purple in colour, and the worm itself is often red or carmine, but sometimes brownish or dark green. The lug-worm makes a burrow about 2 feet, in which it lives with its head downwards. Its castings are in the form of coils of sand lying above the burrow. This worm is much esteemed for bait on some parts of the English coast.

**LUINI** or **LOVINI, BERNARDINO**, was born at Luino, on the Lago Maggiore, about the middle of the fifteenth century. He was a pupil of Leonardo da Vinci. Many of his greatest works, in oil and in fresco, are still in a good state of preservation in the Ambrosian Library, and in the Brera at Milan. Luini was still living in 1630, but the date of his death is not known.

**LUKE, ST.**, the Evangelist. Respecting the birth and early life of this evangelist we have no certain information; of his later history we learn something from his own work, the Acts of the Apostles. A considerable knowledge of the Greek language is displayed in his writings, especially in his introduction to his Gospel, which is written in elegant Greek. On the other hand, his language contains many Hebraisms, and he was evidently well acquainted with the religious rites of the Jews, whose mode of computing time

he follows. (Luke xxii. 1; Acts ii. 1; xii. 3, 4; xx. 6, 16, &c.) Hence it has been much disputed whether he was a Jew or a Gentile before he embraced Christianity. It was a tradition current in Jerome's time, that Luke was a Greek by birth, but became a proselyte to Judaism early in life. The general belief is that he was by descent an Hellenistic Jew, and that he was born at Antioch. From Col. iv. 14, and from the testimony of Eusebius, Jerome, and other early writers, it appears that Luke was a physician.

The first distinct mention of Luke in the New Testament is in Acts xvi. 10, 11, where, in relating the vision which Paul saw at Troas, the writer suddenly begins to use the first person plural, whence it is inferred that Luke here joined the apostle (about A.D. 53), whom he accompanied to Philippi (verse 12). He seems to have remained at Philippi during Paul's journey to Athens and Corinth, for he drops the first person at verse 17, and does not resume it till he relates Paul's return to Philippi (xx. 5, 6). From this time it appears from the Acts that Luke was Paul's constant companion till his arrival at Rome (about A.D. 61 or 63), where he remained with the apostle for some time, probably during Paul's first imprisonment. He is mentioned more than once in Paul's epistles, written during this period (Col. iv. 14; 2 Tim. iv. 11; Philem. 24). Respecting the end of Luke's life, the tradition is, that after Paul's liberation from his first imprisonment he retired to Achaia, where he resided some few years, wrote his Gospel and the Acts of the Apostles, and died at an advanced age (some say eighty, others eighty-four years), probably by a natural death. The emblem chosen for St. Luke in mediæval art was the ox chewing the cud.

**LUKE, ST., THE GOSPEL OF.** See GOSPELS.

**LUKOUR'GOS, LUSAN'DROS, LUSIM'ACHOS.**

See LYCURGUS, LYSANDER, LYSIMACHOS.

**LULLY, RAYMUND,** surnamed the *Enlightened Doctor*, an enthusiastic and remarkable character of the thirteenth century, was born at Palma, in the island of Majorca, in 1234. In early life he followed his paternal profession of arms in the service of the King of Aragon, and abandoned himself to all the license of a soldier's life. Passing from one extreme to another, Lully subsequently retired to a desert, where he pursued a life of solitude and rigorous asceticism. Here he believed he had visions, and, among others, a manifestation of Christ on the cross, who called him to his service and the conversion of the Mohammedans. He accordingly divided all his property among the poor; and in his thirtieth year he began to prepare himself, by diligent study, for the labours and duties of a missionary. Learning Arabic from a slave, he read in that language several philosophical works, the perusal of which, in all probability, suggested to him his celebrated system of mechanical logic, by which he imagined that men might reason upon all imaginable topics without laborious thought, and by means of which he hoped to reform science, and thereby the world itself. Full of this idea, he had a second vision of the Saviour in the semblance of a fiery seraph, by whom he was expressly enjoined to commit to writing and to publish the treatise to which he himself gave the name of "*Ars Lullia*," but which his followers and admirers dignified by the title of the "*Great Art*" (*Ars Magna*). Having besought James, king of Aragon, to establish a monastery in Majorca for the education of thirteen monks in the Arabic language and the duties of missionaries, he went to Rome to seek the countenance of Pope Honorius IV. for similar institutions and his own mission. Receiving, however, little encouragement, he visited Paris and Genoa with the same design, and with as little success. From Genoa he crossed to Africa, where he was in danger of losing his life in consequence of his dispute with a Mohammedan whom he sought to convert, but was saved by the intercession of an Arabian mufti, on the condition of quitting Africa for ever. This promise, however, he subse-

quently considered not to be binding; for, after revisiting Italy, and in vain seeking to excite sympathy and co-operation in his designs, he reassumed, unassisted, his enthusiastic enterprise. Proceeding first to Cyprus, and thence to Africa, he was nearly stoned to death, and, when cast into prison, owed his liberty to the generosity of some Genoese merchants. Upon his return to Europe Lully visited its principal cities, preaching the necessity of a crusade for the recovery of the Holy Land, a plan of which he laid before Pope Clement V., by whom it was received with little or no favour. Unchecked, however, by so many disappointments, and with the ardour of his enthusiasm still unabated, Lully returned a third time to Africa, where his zeal for conversion entailed upon him dreadful torments, from which he was a second time rescued by the generosity of the Genoese. The sufferings, however, to which he had been exposed were so great, that Lully died on his passage home, within sight of his native country, in the year 1315.

In addition to the labours mentioned, Lully devoted much study to alchemy, and was believed to have discovered the philosophers' stone. Although this is obviously legendary, it is certain that he made some important chemical researches, and was acquainted with a considerable number of important bodies.

**LULLY or LULLI, JEAN BAPTISTE**, the father of French dramatic music, was the son of a miller, and born at Florence in 1638. Having attracted the notice of the Chevalier de Guise, he was by that nobleman recommended to Mademoiselle de Montpensier, niece of Louis XIV., as a page, and sent to Paris in his fourteenth year. Not being prepossessing in person, he was sent into the kitchen, but his musical talents soon commanded the notice of the king, and then he rose quickly in public estimation. When the Académie Royale de Musique was founded Lully intrigued in the most despicable manner till, by the favour of the king's mistress, Madame de Montespan, he was placed at its head; and his success in this capacity was so great that he realized a handsome fortune, and was raised to the situation of secretary to the king; often working at his art with the illustrious Molière, who nominally filled a kindred state post. Between them these two crowned the magnificent masques and ballets at the fêtes of the young king with a glory unknown before. On the recovery of Louis from a severe operation Lully composed a "*Te Deum*," and during its rehearsal, while beating the time to the band with his cane, he struck his foot a violent blow, and having placed himself in the hands of a quack, his life paid the forfeit of his credulity. He died in Paris in 1687. Lully is always accused of avarice. He left a fortune of 842,000 livres. Though we cannot respect him as a man, for his stinginess, his falseness, his meanness, and untruthfulness, yet as an artist he is truly great. Many of his ballet airs are still in great favour in our orchestras, needing only such alterations as are necessary to bring them up to the fulness of modern harmony, &c., to make them charming.

**LUMBA'GO**, a rheumatic affection of the muscles of the loins, those on one or both sides being involved. It is usually very sudden in its onset, the patient being seized by sharp pains of a cutting or stabbing character, which are greatly aggravated by any movement of the body which tends to stretch the muscles implicated. The muscles are also very sore when pinched between the fingers, but there is an absence of the acute, defined tenderness upon pressure such as marks abscess or neuralgia. Sometimes the pain is so severe that the patient is confined to bed, and he is unable to move without intense suffering, but generally he can walk or sit, though with difficulty and a good deal of stiffness. The disease is distinguished from inflammation of the kidneys by an absence of pain in the groin and of nausea and vomiting, but careful examination of the back is often necessary to prevent the danger of treating cases of serious disease for simple lumbago.

The causes of lumbago are the same as those of sub-acute rheumatism generally, and they are chiefly two: first, exposure to cold, especially the exposure of the muscles to a cold draught of air when heated by exertion; and secondly, sprain or strain, such as that caused by violent exertion; lifting heavy loads, &c. Where there is a constitutional tendency to rheumatism a very slight exciting cause will be sufficient to bring on an attack of lumbago. The treatment must vary with the intensity of the affection, and it consists in remedying the constitutional condition and relieving the local pain. The Turkish bath, which is a valuable remedy for nearly all complaints of a rheumatic nature, may be used with advantage in lumbago, and if taken at the very commencement of the illness it may be sufficient of itself to afford relief. Where this cannot be obtained a warm bath at bedtime, followed by a dose of Dover's powder, will often remove a slight attack. Local treatment consists in the application of counter-irritants, such as hot linseed or mustard poultices, hot fomentations, with turpentine or laudanum, applied by means of flannel or spongiopiline, to the part, the use of stimulating liniments, the interrupted galvanic current, and the application of a heated iron, with a sheet of brown paper interposed, the iron being moved to and fro under as firm a pressure as the patient can bear, as if ironing linen. Acupuncture, or the pricking of the muscles with a strong sharp needle, is said also to be a very successful method of removing the pains of lumbago. Anodynes, applied locally or taken by means of hypodermic injection, are sometimes called for, and the application of a strong plaster over the part affected is often of great advantage. A belladonna plaster used in this way serves at once to give support and to afford relief. Absolute rest, where it can be obtained, is always a valuable adjunct to treatment. Persons liable to attacks of lumbago should avoid exposure if possible, wear warm woollen clothing, pay attention to digestion and the state of the bowels, and avoid sudden severe muscular efforts.

**LUMBRICUS.** See EARTHWORM.

**LUMP-SUCKER** (*Cyclopterus*) is a genus of bony fishes of the order ACANTHOPTERYGII, forming the type of the family Discoboli. This family is distinguished by having the ventral fins united at the bases to form a round sucking disc, which has a soft leathery margin. The Lump-sucker, Lump-fish, or Cock-paddle (*Cyclopterus lumpus*) is found on the northern coasts of Europe and America, being tolerably plentiful on the more northerly parts of the British coast. It has a thick short heavy body covered with tubercles, four rows of which are large and arranged along each side of the body. The head is large, and an elevated ridge runs along the back. The jaws carry fine teeth. The lump-sucker lives on the sea bottom in shallow water, attaching itself by its disc to rocks, and feeding on crustaceans and small fish. It is preyed on largely by seals and sharks. The female deposits her eggs in a hollow, where the male keeps vigilant guard till they are hatched; then the young fish attach themselves by their suckers to his sides and back, and are carried away into deep water. At the breeding season this fish is adorned with the most brilliant colours, combining various shades of blue, purple, and orange. The average length is about 16 inches, but specimens are sometimes as much as 24 inches long. The male is much smaller than the female. The flesh is much esteemed for food, especially in Scotland. The second species (*Cyclopterus spinosus*) is Arctic; it has the body covered with large conical plates, each with a spine in the centre. The young of both species have naked bodies, the tubercles only appearing gradually.

The second genus of the Discoboli contains the Unctuous Lump-sucker or Sea-snail (*Liparis vulgaris*), found on English coasts. The skin is loose and naked, and pale brown in colour, with irregular streaks of a darker tint. It is usually found under stones at low-water mark. It is

between 4 and 5 inches long. Another species, *Liparis montagui*, is also found on our coasts. Eight species in all of the genus *Liparis* are known from the northern seas. The Cornish Sucker (*Lepadogaster gouanii*) belongs to a distinct family, Gobiesocidae.

**LUNACY.** The subject of lunacy, treated from a medical point of view, will be found in the article INSANITY. Unsoundness of mind is perhaps the most accurate definition of the present legal meaning of lunacy. Formerly a legal distinction was made between lunatics and idiots: a lunatic was one who has had understanding, but has lost the use of his reason; and an idiot, one who has had no understanding from his nativity. The distinction between these two classes of persons of unsound mind also produced some important differences in the management of their property, which have now fallen into disuse. Strictly speaking, perhaps, a lunatic is one who has lucid intervals; but this distinction may also at the present day be disregarded.

Persons of unsound mind may inherit or succeed to land or personal property either by representation, devise, or bequest, but they cannot be executors or administrators, or make a will, or bind themselves by contract. A person of unsound mind, though he afterwards be restored to reason, is not permitted to allege his own insanity in order to make his own act void; for no man is allowed to plead his own disability (18 Vesey, 590), unless he has been imposed upon in consequence of his mental incapacity (2 Carr. & P., 178; 3 Carr. & P., 1, 30); and an action will lie against a lunatic for the supply of necessaries suitable to his station. Acts done during a lucid interval are valid; but the burden of proving that at the time when the act was done the party was sane and conscious of his proceedings lies upon the person asserting this fact. The marriage of a person of unsound mind, except it be solemnized during a lucid interval, is void; but if husband or wife become insane at any time after marriage that is no ground for instituting proceedings for divorce.

As a general rule it may be laid down that where unsoundness of mind, of such a nature as to render the party incompetent to exercise any self-control, is established, criminal punishment will not be inflicted, but he will be kept in safe custody during the pleasure of the crown (39 & 40 Geo. III. c. 94, and 1 & 2 Vict. c. 14). On the subject of criminal responsibility, and what constitutes unsoundness of mind in a legal point of view, the reader is referred to the various treatises on medical jurisprudence. The legal doctrine on the subject, as laid down very clearly and strongly in the case of Reg. v. Blomfield, in 1875, is that, in order to exonerate a criminal from legal responsibility, it is necessary to show that he was suffering under a mental derangement which misled him, either as to the specific nature of the act he was doing, or as to its being a wrong action. A lunatic is responsible for acts committed during "lucid intervals," a term by which is understood, however, not mere remissions of the violence of the disease, but periods during which the mind resumes its perfectly sane condition. In forming an opinion concerning such lucid intervals, the absence of the signs of insanity must have considerable duration before it can be concluded that the mind is perfectly sane; for lunatics, when apparently convalescent, are subject to sudden and violent paroxysms.

Extensive alterations were introduced into the law and practice in lunacy by an Act passed in 1865, and the orders thereunder. Of these we name the principal:—A general commission was issued to the Masters in Lunacy in lieu of the special commission formerly issued in each case. Juries were dispensed with, unless in particular cases it be found important to call them. The inquiry as to the state of mind is, except under special circumstances, not carried back, but limited to the present time. All matters affecting the person and property of the lunatic may, after the inquisition, be proceeded on before the masters without any

special order of the lord chancellor for the purpose; and the provisions for insuring through the visitors and masters the proper care and treatment of the lunatic are made more comprehensive.

The following Acts contain amendments:—25 & 26 Vict. c. 86 (which provides that every lunatic shall be visited by the proper officers at least four times a year), and the 26 & 27 Vict. c. 110. The chief amendments comprised in the last Act are—That the inquiry as to the state of mind shall be confined to the question whether the person is at the time of inquiry of sound mind, and no evidence as to anything done or said by such person, or as to his demeanour more than two years before the time of inquiry, shall be received as evidence of insanity. The lord chancellor is given power to apply in certain cases the property of a lunatic for such lunatic's benefit.

The law of Scotland recognizes two distinct kinds of mental incapacity—fatuity or idiocy, and furiosity or insanity. Persons labouring under mental disease in either form are protected by law, both as regards their persons and estates. But the amount and nature of the protection accorded to them varies, according as their incapacity is total and permanent, or partial and intermittent.

*Plea of Insanity in Criminal Cases.*—In criminal cases insanity may be pleaded either in bar of punishment or in bar of trial. The old test of insanity—that the panel did not know the distinction between right and wrong—is now completely exploded. Wherever there is clear proof of the existence of mental disease clouding and dethroning the mind, the defence of insanity will be admitted.

By the Roman law persons of unsound mind might be deprived of the management of their property and persons on application to the prætor by their next of kin. This regulation dates back to the time of the Twelve Tables. The curatory was given to the nearest cognate of the lunatic, and when there were none, the prætor or the præses in the provinces named one. (Dig. 27, 10, 1.) An insane person could not make a will or exercise any other civil right so long as his malady lasted. When it ceased the curatory fell at once. By the code of the Twelve Tables prodigals were placed under the same restraints as lunatics with regard to the management of their affairs. See also LUNATIC ASYLUMS.

**LUNAR CAUSTIC**, a term applied to the fused nitrate of silver, when produced in small cylindrical cakes. It bears a whitish-striated appearance, decomposing and turning black when exposed to the air. In surgery it is frequently employed, sometimes to cauterize warts, ulceration of the mucous membrane of the throat, and the proud flesh which grows up about wounds and ulcers. It is also sometimes used to stimulate the action of lethargic ulcers as well as in ophthalmic affections and many varieties of skin disease.

**LUNAR MONTH**, the time which the moon takes to complete a revolution round the earth, or about twenty-nine and a half days. A lunar year consists of twelve lunar months. See CALENDAR.

**LUNATIC ASYLUMS.** The subject of insanity and asylums for the insane has of late years occupied a very large share of public attention, particularly as an opinion has prevailed that insanity is on the increase in this kingdom beyond the ratio of population. It is, however, believed that this alleged increase has not much real foundation, but is chiefly owing to the fact that many cases not formerly so dealt with are now taken to asylums.

Two Acts passed in 1845 (8 & 9 Vict. caps. 100 and 126) placed the powers vested in the Commissioners in Lunacy on an entirely new footing, and in many respects modified the constitution of asylums. The first Act appointed six commissioners, three of whom were physicians and three barristers, with salaries; and five other commissioners, who act gratuitously. The rule that none of

these shall be connected with any asylum was continued. Licenses to receive lunatic patients are granted by these commissioners at each of their quarterly meetings. No license is to remain in force more than thirteen months, and the notice of a wish to renew must give the number of patients then confined. The jurisdiction of the commissioners extends to the whole of London and Middlesex and Southwark, and to all places within 7 miles of London, Westminster, and Southwark. In the country the licenses are granted by the justices of the peace in quarter session, who are bound to appoint three of their number, together with one physician, surgeon, or apothecary, as visitors of the asylum licensed by them. Strict regulations are enforced for the reception of patients; it is required that every person, not being a pauper, received as insane, shall be certified to be so by two physicians or surgeons, who shall visit such patient separately, and shall have no interest in the asylum in which such patient is to be confined; and certain entries of these particulars are to be kept at each asylum. For a pauper the certificate of one medical man and the order of two justices are required. Penalties are fixed for neglecting these rules, or those which direct notice to be given of every admission, death, discharge, or escape. Houses having 100 or more patients must have a resident medical attendant, and those of smaller size must be visited by a medical attendant at defined periods, according to their size. Every house within the immediate jurisdiction of the commissioners must be visited by them at least four times a year, and every other house at least twice in every year. Similar powers are given to the visitors in the country. The commissioners have to present an annual report to the lord chancellor of the state of the different asylums visited by them, which report must be laid before Parliament. An important alteration was made in the law concerning the care of single patients. Orders and medical certificates must now be procured for the care of one patient similar to those used for the admission of patients into licensed houses; and copies of these documents must be privately sent to and registered by the secretary to the commissioners. This Act only extends to England and Wales, and it does not affect Bethlehem Hospital, London. The persons appointed to hold commissions "De Lunatico Inquirendo," previously styled Commissioners, were in future to be termed "Masters in Lunacy."

The second Act, which repealed 9 Geo. IV. c. 40, and is now itself repealed by 16 & 17 Vict. c. 97, related to the regulation of lunatic asylums for counties and boroughs, and the maintenance and care of pauper lunatics, and gave to the commissioners a greater power over these institutions. The justices of every county and borough were compelled to erect or join in the erection of an asylum when none such already existed; and all proposals, agreements, and plans, and the rules and regulations of each asylum, were to be submitted to the commissioners, and they and all contracts and estimates approved by the secretary of state. Contracts for the care of insane persons in licensed houses do not exempt any county or borough from the obligation of providing an asylum. This Act extends only to England and Wales, and does not apply to Bethlehem Hospital. Medical men signing false certificates are made guilty of a misdemeanour; and certain penalties are inflicted on officers and servants ill-treating lunatics. The justices of the peace have to appoint a visiting committee, to whom everything has to be submitted. The visitors may grant retiring allowances to the officers not exceeding two-thirds of their salaries; have to draw up rules for the regulation of the asylum, the same to be submitted to the secretary of state; to fix weekly rates for the maintenance of each pauper lunatic; to appoint a chaplain, medical officer, clerk, and treasurer; and to audit the accounts. Every pauper lunatic not in an asylum or licensed house must be visited by the medical officer of the union

once a quarter. The Act contained provision as to the care of lunatics wandering at large, and also the certificate under which an insane person is to be received into an asylum. It provided for raising the funds for the maintenance of the asylum; enacted the penalties for breaches of the Act; and contained ample directions as to the disposal of the lunatic's property.

There can be no question that on the whole these laws have been carried out in a satisfactory manner, but the experience gained since they were passed has revealed certain defects which urgently call for removal. On the one hand, it has been shown that the law in its present condition affords hardly sufficient protection against the incarceration of persons not really insane; and on the other hand, the heavy responsibility incurred by medical practitioners in certifying cases of insanity has rendered them in many instances unwilling to do so except in the most obvious and extreme cases. That the first of these dangers is not illusory was conclusively shown by certain proceedings, which attracted much attention, instituted during 1881-85 against several persons by an intended victim who had happily escaped them; but it must also be remembered that when in 1877, in consequence of a *cause célèbre*, a parliamentary committee sat during the whole of a summer session hearing and examining medical experts, discharged lunatics, government officials, and all those willing and able to furnish any information of interest, the result of the investigation was to show that no *mala fides* was proved in a single instance. The committee, however, recommended certain alterations in the existing laws, and a promise was made on the part of the government that these should be embodied in a new Act dealing with the subject. A bill was brought in in 1886 by Lord-chancellor Herschell, but failed to become law.

*Management of Lunatic Asylums.*—For a very long period it was unfortunately taken for granted, both in England and in other countries, that insanity was incurable, and coercion and confinement were the chief appliances used in all cases where any restraint appeared necessary. When they were supposed to be harmless, lunatics and idiots were suffered to wander about the country, trusting to precarious charity, and subjected to occasional whippings. The worst cases only were admitted to the asylums which were so sparingly provided, and the treatment of the inmates in these institutions was often brutal in the extreme. In the old Bethlehem Hospital (Bedlam), for instance, the patients, chained to the wall like wild beasts, were shown to the public on certain days of the week at the charge of 2d. a visitor, being often excited to rage to make the exhibition more stimulating. Such scenes were not peculiar to England, but could be paralleled in almost every country in Europe. At length in 1792 a benevolent Frenchman, named Pinel, made the first systematic attempt to restore the insane to a position among human beings. His plan, which was designated the non-restraint system, was at first ridiculed and scoffed at; but by dint of great perseverance and continuous personal exertions he at length induced the governors of the Bicêtre, an hospital near Paris, to permit him to unchain some of the inmates, and so salutary were the effects of his experiment, even on the first day, that the old plan was soon entirely abolished and a course of milder treatment pursued. England is proverbially slow in adopting improvements, and for twenty-three years after the chains had been removed from the inmates of the Bicêtre, the old mode of treatment continued in full force in this country. It is true that nearly simultaneously with the early measures of Pinel, and, as is believed, without any knowledge of them, Mr. William Tuke, a Quaker, conceived the plan of founding an hospital for the treatment of the insane upon principles more enlightened and humane than those which then prevailed; and his idea was carried out by the

construction of "The Friends' Retreat" for the insane, at York, which was opened in 1796.

But it was not till the year 1813 that the English government took up the matter. In that year a committee of inquiry was appointed to investigate the state of the York Asylum—special attention having been directed to this particular institution in consequence of the success of the Friends' establishment in that city—and the horrors which were then divulged could scarcely be credited if they were not well attested by facts. The state of the patients at Bethlehem was next inquired into, and they were found to be even worse treated than those at York. From this time a gradual, but very slow, improvement in the condition of the insane may be noticed. Chains were removed, and leather restraints of much milder kinds substituted, and more care was given to the warming and clothing of the patients. Between 1815 and 1830 many large asylums were opened in England. They were built on the then most approved principles, and in all of them the milder methods of treatment were adopted. Things continued to gradually improve, and in 1839 Mr. Hill, the surgeon of the Lincoln Asylum, published a work in which he advanced the following proposition as a principle:—"In a properly constructed building, with a sufficient number of suitable attendants, restraint is *never necessary, never justifiable*, and always injurious, in all cases of lunacy whatever." The doctrine was at first declared, even by those in favour of the milder treatment, to be too decided, and likely to produce a bad effect; but fortunately the lapse of forty years has proved its perfect truth, by its adoption in all the most important asylums in the kingdom.

The views of Dr. Hill as to a system of non-restraint are not only now fully adopted, but the best authorities on the subject at the present day question even the propriety of erecting large asylums at all, arguing that such a system only condenses and aggravates the malady. At Ghent, in Belgium, there is a kind of lunatic colony, where the patients are dispersed among 600 different dwellings, under the care of *nourriciers*, or attendants, in whose occupations they share, and with whom they live as belonging to the family. It is here held that the true principle of cure for the unsound is the association with healthy minds. The entire colony is of course under proper government and medical supervision. The nearest resemblance we have, on any large scale, to the Belgian colony is the Scotch plan of boarding out patients, who are distributed among their friends and in licensed houses. A good example of the beneficial results of this system is to be found at North Berwick, a salubrious watering-place near Edinburgh, where numerous patients are regularly taken in groups of half a dozen or so at a time, returning, after a week or two's sojourn, invigorated and refreshed.

The treatment of insanity, as usually pursued at the present day, is divided into two parts. One of these might be termed the *direct*, the other the *indirect*, but they are generally called the *medical* and the *moral* treatment. The medical treatment consists in the use of such medicines as, in each particular case, will be likely to restore the body to a healthy condition. This treatment, as a method, has undergone a radical change within the last fifty—mostly within the last thirty—years. Formerly, based upon the hypothesis that insanity was a disease of strength, or of active inflammation, it chiefly consisted in the liberal employment of blisters, purgatives, cupping, and blood-letting. Now, founded upon the well-supported theory that the disorder originates in debility, its principal remedies are stimulants and tonics. The success of the present method demonstrates not only the excellence of the practice, but the truth of the theory.

The moral treatment includes the exercise of a mild but firm directive and disciplinary power over the actions of the



patient, by which he is gradually restored to healthful habits and wholesome self-restraint, and the attempt to win him from the vagaries of his delusions to those mental and manual pursuits which give solidity, strength, and activity to the normal mind. The means adopted for the attainment of these ends are, the regular hours of hospital life, appropriate manual labour, walking, athletic and other games, attendance upon religious services, reading and other literary pursuits, lectures upon scientific and miscellaneous subjects, dramas, concerts, balls, and other recreations, entertainments, and amusements. In the method of moral treatment the change has been no less thorough than in that of the medical treatment.

*Statistics of Lunacy.*—At the census of 1881 the number of persons returned as suffering from some form of insanity in England and Wales was 84,503—being in the proportion of 3253 per million of the whole population, or one person of unsound mind in every 307. In 1871 the proportion was 3034 per million, or one in every 329. Of the 84,503 insane persons in 1881 the number of males was 39,789, and of females 44,714, and the proportion was one in every 318 males and one in every 293 females. In a certain sense, therefore, it is indisputably true that there is more insanity among females than among males, namely, in the sense that out of equal numbers living of each sex and at all ages there are more insane females living than insane males. But it must be clearly understood that this statement is by no means identical with another that is sometimes confounded with it, namely, that the proportion of females who are attacked by insanity is higher than the proportion of males similarly attacked. Not impossibly, nor improbably, the contrary is the case. It may very possibly be that mental disease attacks a larger proportion of males than of females, but that, owing to the enormously high death-rate of the male insane as compared with the female insane, the number of the latter living at any given moment comes to be greater than the number of the former. The male cases that occur are on this hypothesis more numerous, but are rapidly swept away by death, while the female cases, though fewer in number, live on and accumulate.

The number of lunatics in Scotland in 1881 was 8406—the males being 3939, and the females 4467. The proportion was 2250 per million, or one in every 444 of the population. At the previous census the proportion was one in every 494 of the population. In Ireland the number was 9774 (4857 males and 4917 females), being in the proportion of one in every 529 of the population.

The French statistics of lunacy are very full and very instructive. The number of lunatic asylums in France amounts to 103, of which sixty-one are public and forty-two private. Of those nine are exclusively for men and fourteen for women; the rest are for both sexes. A considerable increase of lunacy has been noticed in France for the last fifteen years. In 1868 the number of lunatics was 34,000; in 1887 it was nearly 60,000, of whom 28,000 were men and 32,000 women.

The total annual cost of the maintenance of pauper lunatics in the United Kingdom amounts to over £1,000,000. It was formerly defrayed entirely by the local authorities, but in 1874 Parliament agreed, in relief of local taxation, to give a subvention of 4s. a week for every pauper maintained in a lunatic asylum. The effect has been to reduce the charge upon local taxes by a sum of from £380,000 to £300,000, which is now annually voted from the imperial exchequer.

*Prevention.*—A very interesting and instructive little volume by Dr. Andrew Wynter, entitled "The Borderlands of Insanity" (London, 1875), threw great light upon the preventibility of a large percentage of the insanity which prevails. Science, however, has hitherto discovered medicine which acts as a specific cure for insanity, and

none which is a prophylactic or preventive of the disease. The chief power of prevention in the case of each person lies with that person himself. The man of sound judgment and prudent self-control will be "moderate in all things," avoiding those habits, practices, or excesses which exhaust or depress the vital force, allowing himself sufficient sleep to enable the brain and body fully to re-invigorate themselves from the fatigue of ordinary and wholesome labour, and living as near to nature as our multifold artificialities will permit.

In his work on "Responsibility in Mental Disease" (London, 1874) Dr. Maudsley maintained that insanity is as much within our power as the cause or prevention of physical ailments. There are many persons who, especially after periods of intense thought, have had the feeling that it would not be a hard matter to become insane—in fact, something of an effort was required to preserve their sanity. Hence the important question, How may a man prevent himself from going mad? The answer to this is, first, he must devote his mind to one great purpose, even though this verge into eccentricity, for eccentricity may be a vicarious relief, a sort of masked madness. Secondly, there must be strengthening of the will by constant exercise. Thirdly, he must act consistently with his belief. Religion must be as real as it is reputed to be. The slovenly habits of thought engendered by some modes of worship, and the unhealthy excitement and morbid egotism that are sometimes the result of mistaken religion, are each conducive to insanity. Alcoholic liquors should be avoided, not only as unnecessary, but as absolutely harmful. The mind should not gain, by the fictitious aid of a stimulant, the energy which should come from the calm resolution of a developed will. "Were men with one consent to give up alcohol and other excesses; were they to live temperately, soberly, and chastely, or, what is fundamentally the same thing, holily—that is, healthily—there can be no doubt that there would soon be a vast diminution in the amount of insanity in the world." Lastly, the reasoning powers must be most carefully exercised on the matter of marriage. Misplaced affection, disappointment in love, an unhappy union, are all more or less potent factors in the cause of insanity. Falling in love should not be allowed to be a mere matter of propinquity. In the breeding of farm stock or stud we know that good or bad qualities will be produced in the animals according to the selection of the pairs; but men not habitually as if the same laws were not applicable to themselves. The consequence is that those who have a tendency to insanity are not unfrequently prone to seek others having the same mental qualities. After marriage external circumstances are allowed to foster their special tendencies, and the children who are born are doubly cursed—with the inheritance of a bad descent, and in the training which they get, or rather do not get. Here, then, are causes of insanity which it is within man's power to remove—hereditary predisposition, by abstention from marriage or by prudent marriage; intemperance, by temperance in living; mental anxieties, by the wise cultivation of the mind, and by the formation of self-government. Similar views are enumerated in another valuable and useful work, entitled "Insanity in Ancient and Modern Life, with Chapters on its Prevention," published in 1878, by Dr. D. H. Tuke, in which the author points out how those who know that the seeds of insanity lie dormant in their constitution by hereditary descent may, for the sake of their descendants as well as themselves, check their growth and, if possible, stamp them out.

**LUNDY ISLE**, a rocky island in the Bristol Channel, England, 11 miles N.N.W. of Hartland Point. It is 8 miles long, north to south, by 1 mile broad, and rises in the north to the height of 800 feet, in a hill called the Constable, and is accessible only by one bay on the east side. It is composed of granite and coarse sandstone, with



shells and plants. There is an old castle and lighthouse on the south end, and on the east side, at the south end, a small island called Slut Island. Lundy Island was the scene of a treacherous and cruel attack upon the islanders by a French war ship towards the end of the seventeenth century. A party was landed, as from a Dutch ship, under the pretence of burying one of the crew, and the unsuspecting inhabitants were suddenly attacked and the island ravaged.

**LUNEBURG**, a town of Germany, in the Prussian province of Hanover, and the chief town of a province of the same name, is situated 80 miles south-east of Ham-burg, on the Ilmenau, which is here navigable about 15 miles above its junction with the Elbe, and on the Hanover and Hamburg Railway. The population in 1880 was 19,034. The town was formerly surrounded with walls, but the fortifications are now dismantled. The principal buildings and public institutions in the town are the palace, the gymnasium, St. Michael's Church, in the vaults of which are the monuments of the ancient princes, the convent of St. Michael, the town-hall, the arsenal, military academy for nobles, cavalry barracks, hospital, &c. The inhabitants carry on a considerable trade in the products of the country, such as linen, salt, wax, honey, woollens, linen thread, flax, horses, of which 70,000 are annually brought hither to market, &c. There are very productive salt works in a part of the city which is separated from the rest by a wall, and is called the Sülze. Great quantities of lime are burned in the Kalkberg, a hill near the town, and sent to Hamburg and Holland. There are manufactories of soap, breweries, distilleries, a paper mill, &c., and a very active transit trade is carried on with Hamburg and the interior of Germany.

**LUNETTE.** See FORTIFICATION.

**LUNÉVILLE**, a town in the French department of Meurthe, 180 miles east from Paris, is situated at the confluence of the Vezouse and Meurthe. It has a tribunal of first instance, a college, and 14,955 inhabitants. Léopold, duke of Lorraine, resided here, and built a palace, which was subsequently much improved by Stanislaus, ex-king of Poland. Both these princes made great improvements in the town, which presents wide, straight, and well-built streets, and some handsome squares. Behind the palace is the parade ground or Champ de Mars, which covers a space of 500 acres. The other remarkable objects in Lunéville are the parish church, the immense cavalry barracks, with stabling for 6000 horses, the riding school, which is considered the finest in France, being large enough for 200 horse soldiers to exercise in, the hospitals, Jews' synagogue, a theatre, and the Place Neuve, which is ornamented with handsome buildings. Great bodies of cavalry are frequently collected at Lunéville in the autumn for the purpose of manœuvring on a large scale. The town has manufactures of woollen cloth, yarn, holseries, lace, gloves, earthenware, sheet iron, and beer; it has also a good trade in wine, corn, brandy, hemp, flax, wood, &c. The origin of the town is uncertain, but its name seems to indicate that Diana was anciently worshipped here, and several Roman medales, with the impress of that divinity, have been found near a fountain in the neighbourhood. By the treaty of peace signed at Lunéville, 9th February, 1801, the Rhine was made the limit between France and Germany.

**LUNGS.** The lungs are the organs of respiration. It is by their means that the dark venous blood is brought into contact with the air, so as to permit its reoxygenation. See RESPIRATION.

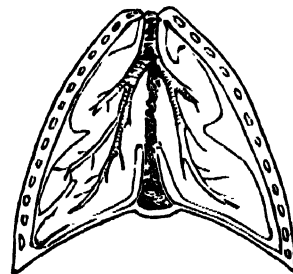
Each lung may be compared to a bunch of grapes. It consists of an infinite number of little cells, each not larger than a millet seed, fixed upon footstalks, each footstalk being a tube, a branch of the windpipe. When the air comes in through the windpipe, then all these air-cells become filled; and this is done by the heaving of the chest,

which is called *inspiration*. When again the chest falls, the air-cells are partially emptied, but never completely, and the air which was in them is blown out by the wind-pipe: this is called *expiration*.

The larynx or windpipe is a tube (*b* in fig. 1 of Plate), consisting of eighteen or twenty cartilaginous rings, united by an elastic membrane; it is connected to the back of the mouth, where the air enters it; it passes down the front of the neck, enters the upper orifice of the chest behind the top of the breastbone, and divides into two branches (*c* in Plate), one for the right lung and one for the left. In the lung the windpipe subdivides into a great multitude of branches, as shown in fig. 1, *d*. These tubes and air-cells are lined with a delicate mucous membrane, and their coats become exceedingly thin, so that the air within them, and the blood without, can exercise a chemical influence on one another through them. The pulmonary artery, which brings the dark blood from the right side of the heart, divides into two branches, one for each lung, and each branch subdivides into minute ramifications, which spread themselves over and between the air-cells. The pulmonary veins take their commencement from the arterial capillaries on the surface of the cells, and unite with one another till two large ones are formed from each lung, which convey the red purified blood into the left auricle.

The vesicles have been described as being fixed to the air-tubes, in the same manner as a bunch of grapes is fixed to the footstalk; but here the similarity ends, for the cells are so small and so close together that no interstices between them can be perceived. Indeed, on looking at the surface of a lung it seems to consist of an infinity of shining points, which, on being examined more closely, are found to be the cells filled with air. After air has once got into the lungs it can never be completely expelled: hence the lungs of a person who has breathed always float in water; and on this fact is founded the test used in criminal examinations, to distinguish a stillborn child from one that has breathed, where there is a suspicion of child-murder.

In the accompanying figure the front of the chest is represented as cut off, so as to show the lungs without it. The windpipe is seen descending and dividing into its two branches, which are entering into the lungs; but the branches of the arteries and veins are omitted, because they would



have made it too complicated. Each lung is of a conical form—its base below and its apex above; its base rests on the upper surface of the diaphragm, its apex reaches up into the root of the neck, its back touches the spine, and its front and outer parts are covered by the ribs (as seen in fig. 2). Towards the middle the lungs are not in contact, being there separated by the space in which the heart lies. Each lung is divided by fissures into lobes, of which the right lung has three, and the left only two; the place of the middle lobe being occupied by the heart, which, it has already been stated, though in the middle, encroaches upon the left side. The whole lung, except the part where the windpipe and bloodvessels enter it, is covered by a thin smooth membrane called the *pleura*, which is represented

in the woodcut. It is a shut sac, having one layer investing the lung, and the other lining the walls of the chest, the walls of which are in contact, so that it forms a close bag; though in the drawing, for the sake of plainness, a space is represented between them. The pleura is moistened with a thin serous fluid, similar to that in the pericardium, which enables the lung and chest to glide upon one another in the action of breathing. This membrane is very liable to become inflamed, causing acute pain, and constituting the disease called *pleurisy*.

When a child is born its lungs are empty, and the sides of the chest are as much compressed as they can well be. Whenever it has got into the air the elasticity of the ribs causes its chest to enlarge; the outer surface of the lung, being in contact with the chest, accompanies it, and so a tendency to the formation of a vacuum is caused. The air now rushes down the windpipe into what would otherwise be empty space, and thus the first inspiration is made, and when once made it is repeated eighteen or twenty times per minute, during the whole course of our existence.

The lungs of a man are estimated to contain about 830 cubic inches of atmospheric air when filled as full as they can hold, by drawing in the breath to the utmost. At each act of respiration we draw in and expel about 40 cubic inches, so that when the lungs are at rest, after an ordinary expiration, they contain about 290 cubic inches. Now 40 is very nearly one-eighth of 330, so that about one-eighth of the air in the lungs is renewed at each act of respiration. Besides the 40 cubic inches expelled in ordinary expiration, we can, by an act of the will, blow out 170 cubic inches in addition, making the whole quantity expired amount to 210 cubic inches. This still leaves 120 cubic inches in the lungs, which therefore never collapse, but always float in water. In fig. 8 in Plate the lungs of a bird are represented, to show the remarkable contrast in shape between them and the human lungs.

*Diseases of the Lungs.*—The highly organized structure of the lungs, and the incessant exercise of their important function, frequently under noxious circumstances, render these organs perhaps the most liable to disease of any in the body. Exposure to damp and cold, sudden atmospheric changes and transitions of temperature, want of proper nourishment, inattention to personal cleanliness, and some of the mechanical employments in which the confined and heated atmosphere of workshops is impregnated with minute particles of foreign substances, such as steel, wool, &c., may be considered as among the chief exciting causes of this extensively prevailing class of diseases. The most common and most important of the diseases of the lungs has already been described in the article CONSUMPTION, and others will be found noticed under the headings ASTHMA, BRONCHITIS, and PLEURISY.

Another affection unhappily somewhat common in the changeable climate of Great Britain is that known as inflammation of the lungs, or more technically pneumonia. In this complaint it is the substance of the lung itself that is attacked, the air-cells and parenchymatous structure of the organ being the seat of the disease. As a rule, only one lung is involved, but occasionally there is inflammation of both lungs, and the disease often co-exists along with other chest complaints. The most frequent exciting cause of inflammation of the lungs is cold in some form or other, and the greatest number of cases occur during those months of the year in which there are the greatest vicissitudes of temperature, notably March, April, and May. It is more common among men than among women, owing to the former being, from the nature of their occupations, more exposed to the influence of the weather. It is generally very sudden in its onset, being usually ushered in by a feeling of weakness and depression, which is followed by a sense of chilliness and severe fits of shivering. Other symptoms of fever then become manifest,

nausea, cough, pain in the side, and distressed breathing, the respirations increasing from about twenty in a minute to thirty, forty, or even more, up to sixty or seventy. The cough, which is short and hacking, is accompanied by expectoration, the sputa being of a very tenacious and sticky character, and of a peculiar rusty colour. There is also a very marked rise of temperature on the invasion of this disease, and it is not uncommon for the thermometer to mark 103° or 104° within a few hours of the first feeling of illness, and this high temperature is generally maintained until the period of crisis. As the complaint progresses it is attended by headache, sleeplessness, and there is commonly slight delirium, especially towards the evening, when the fever reaches its highest degree. The digestive organs are also much disturbed, there is loss of appetite and thirst, the bowels are generally confined, the tongue becomes coated with a white fur, and occasionally the patient is troubled with vomiting.

These symptoms usually continue for several days, and generally a well-marked crisis takes place about the end of the first week of the disease. The time, however, may vary from the third up to the twelfth day, and there is an old but unfounded theory that the crisis always occurs on one of the odd days. In the majority of cases the crisis is marked by a rapid fall in the temperature, the skin becomes moist and perspires freely, the urine, which has been scanty, is increased in quantity, the respiration falls in frequency, and, to a less extent, the pulse also. Occasionally the constipation gives way to diarrhoea; there is bleeding from the nose, and an eruption appears upon the skin. Very often after this change the patient falls into a deep sleep, and on waking feels that the worst of the disease is over, and rapidly recovers. At other times the process of recovery is more protracted, the temperature falling by slow degrees, interrupted by more or less severe exacerbations, and the condition of the patient being marked by great debility. When the termination of the case is unfavourable, death generally occurs at the end of the first, or the beginning of the second week, its advent being marked by wandering of mind, coldness of the extremities, increased difficulty in breathing, a feeble ineffectual cough, and ultimately a state of partial coma.

With respect to the treatment of this disease it was formerly the custom to bleed largely and to employ depressing medicines, such as tartar emetic; but since the true nature of the complaint has been more clearly perceived a more rational method has been introduced, and the mortality has been greatly diminished. It is now understood that, like certain other fevers, the progress of the disease cannot be cut short or arrested by any specific, but that it must be the effort of the physician to maintain the strength of the patient, to modify the more dangerous elements of the disease, and thus to assist it towards a favourable termination. As soon as the disease has manifested itself the patient should be confined to bed, and the room should be well ventilated and kept at a temperature of about 60° Fahr. The diet must consist chiefly of liquids, and of these the best that can be used is milk, of which from 2 to 3 pints may be given in the course of the day. Stimulants in moderate quantities are often useful in promoting appetite and assisting the digestive process, and a draught combining an acid and bitter may be prescribed for the same purpose. A simple aperient is generally required to relieve the constipation, though active purgation is to be avoided. The pain in the side, which is often severe, may be greatly relieved by hot fomentations, or by the application of large hot linseed poultices to the chest and back, which should be renewed as often as they get cold. Where there are signs of cardiac failure stimulants are required, and where it becomes necessary to diminish the pyrexia quinine may be given in

combination with a stimulant in somewhat large doses. In all cases skilled medical assistance should be procured as early as possible, as the complaint from its serious character and attendant dangers is quite beyond domestic treatment.

*Hæmoptysis*, or spitting of blood. Expectoration of blood may occur either by exhalation from the mucous membrane of the air-tubes or from the lesion of a blood-vessel. It generally occurs in early life, from the age of fifteen to thirty-five, and in the former instances may be dependent upon local congestion. This determination of blood to the lungs may be occasioned by the sudden suppression of some natural or accidental discharge from other parts, as in suppressed or impaired menstruation, or the arrest of a hæmorrhoidal discharge, or by pressure of tuberculous matter. From the latter cause it is frequently a sign of approaching consumption. The expectoration of blood is attended with cough. Sometimes the quantity brought up is very considerable, and is expelled with violence; at other times the sputa are only streaked with it. The expectorated blood is generally of a vermilion colour, and when in small quantities it is frothy and mixed with air. When the blood comes from the stomach, it is brought up by vomiting and without cough, without the frothy appearance, and of a dark grumous character. Although the spitting of blood may be a sign of serious disease, this is by no means an invariable consequence, as it often attends a paroxysm of cough which is somewhat severe and prolonged, in cases where there is no indication of consumption.

Pulmonary apoplexy occurs when blood is effused into the parenchymatous structure of the lungs.

*Malignant Diseases.*—The lungs are also subject to diseases of a specifically malignant nature, such as medullary sarcoma and melanosis; but these rarely occur as a primary affection. The medullary and melanoid matter is deposited in these organs as a secondary affection, in conjunction with its existence in other parts, and frequently in all or the majority of the organs of the body.

Inflammation of the pleura is treated of under PLEURISY.

**LUPERCI**, the priests of the god Lupercus, whom the Romans sought to identify with the Greek god Pan, the most ancient order of the Roman priesthood. They were instituted in honour of Romulus and Remus, as it was to the protection of the wolf-god (Lupercus), saviour of shepherds, that the twins owed their life; for when exposed to die at their birth, a wolf was recorded to have suckled them. The place where the priests assembled was called *Lupercal*, and the festivals took the name of *Lupercalia*. They continued till A.D. 496, when, on account of their licentiousness, they were abolished by Pope Gelasius. The greatest ceremony of the *Lupercalia* (15th February) was the curious purification of the city by goats' blood (scape-goat). Two youths were touched on the forehead with the blood of goats, and the skins of these goats were then cut into pieces and worn by the Luperci, who went otherwise half naked at this festival. The trimmings of the skins they cut into thongs, and in this guise they ran about the city striking with them every one they met. Women put themselves forward to be struck, esteeming it a sure presage of fruitfulness and security in child-bearing. The name *Februare* means to purify, showing that the *Lupercalia* were older than the name of the month itself. Mark Antony was a Lupercus when consul, and joined in this half-naked procession of runners. It was at the *Lupercalia* that Mark Antony offered Cæsar the kingly crown, and he refused it, saying, "The Romans have no king but God."

**LUPINE** (*Lupinus*), a very extensive genus of hardly annual, perennial, and half-shrubby plants, commonly cultivated in gardens for the sake of their gaily coloured flowers. The species inhabit the western parts of America, from British Columbia to Bolivia. A few species are found in the United States and Brazil, and a few in the Mediterranean region. The genus is nearly allied to *laburnum* and *broom*.

**LUPULIN** is the yellow powder found in the flower of the hop (*Humulus lupulus*, natural order URTICACEÆ). It contains a bitter principle and a volatile oil and resin; these together give the aromatic bitter flavour to beer. It is also used in medicine as a narcotic in doses of from 2 to 5 grains.

**LUPUS** or **WOLF** is the name which is given to several forms of chronic disease of the skin, and is suggestive of their devouring and destructive nature. The following are the chief varieties of the disease:—(1) *Lupus erythematosus*, which is the least troublesome and serious form, and which is marked by the appearance of a number of deep red or livid patches on the skin of the cheeks or nose, which, after remaining for a long period unaltered, become covered with thin dirty looking crusts, and ultimately end in a thin white scar. Sometimes both cheeks are attacked at once, and the patches spread and unite across the nose, while in other cases the scalp, ears, eyelids, lips, or back of the hands become seats of the disease. It seldom occurs before the age of puberty, is more common among women than men in the proportion of eight to one, is not hereditary or ultimately connected with any other special disease, and it attacks all classes of society. Beyond the disfigurement which it causes, it is attended with very little pain or other inconvenience, except perhaps slight itching, but it is very obstinate and difficult to cure, and often lasts for years. Treatment consists in careful attention to the general health, diet, and nutrition, and the exhibition of mild caustic applications to the part affected, followed by soothing applications, many such alternations being usually required before a cure is effected. (2) *Lupus non exedans*, a more serious form of the complaint, usually begins as one or more small smooth, reddish-brown or reddish-yellow blotches, set upon a dark red base of thickened skin. These slowly increase in size, and coalesce so as to form patches and become covered with small horny-like scabs, which may disappear without leaving open sores, though a distinct deep scar remains, or they may ulcerate and thus develop into the most dangerous and severe form of the disease, known as (3) *Lupus exedans*. This affection, formerly termed *Noli me tangere*, begins almost exclusively on the nose at the tip of the edges, and it often attacks simultaneously the skin and the internal mucous membrane. Red or brownish-red nodules are first formed, beneath which ulcers are found to extend, the surrounding parts being swollen and the edges of the ulcers of a pinkish colour. There is also a copious purulent secretion, and unless remedial measures are promptly applied the ulceration may attack structures deeper than the skin, and spread until a considerable portion of the nose, or even the whole of it, is destroyed, and severe inroads have been made into the tissues of the cheeks and lips. Though not a fatal disease of itself, it is one of a very serious character, from the great deformity which it may give rise to. Happily it is a complaint of very rare occurrence. It is in no way due to syphilis, either hereditary or acquired, and though it sometimes occurs in scrofulous persons, in the larger number of cases the persons attacked seem otherwise healthy. Unlike the first-mentioned form of lupus, this affection usually begins early in life, and rarely appears after the age of thirty. It is more common in females than in males, and occurs more frequently in the country than in the large towns. The treatment of

"You all did see how on the Lupercal  
I thrice did offer him a kingly crown,  
Which he did thrice refuse. Was this ambition?"  
—*Mark Antony's Speech in "Julius Cæsar."*

*Lupus non exedans* is much the same as that indicated for *Lupus erythematosus*, with the exception that more active external remedies are required, but in dealing with the more destructive *Lupus exedans* the applications must be of greater power and more rapid in their action. The caustics most generally used to destroy the new tissue formed by the disease are caustic potash, nitrate of silver, and acid nitrate of mercury. Other methods consist in the scarification of the nodules, or the removal of the diseased tissue by blunt "scrapers" or "spoons" made for this purpose. It will be obvious that for the use of such powerful remedies or mechanical methods, delicate surgical manipulation and careful medical control are requisite.

**LURCH'ER** is the name of a dog which was originally bred as a cross between the greyhound and the shepherd's dog, but was subsequently modified by a cross with the spaniel. It is lower and more thickly built than the greyhound. It is marked by short ears, thick, wiry, and sandy-coloured hair. The lurcher is quick at scent, a fleet runner, and, when used by poachers, very destructive to game.

**LURGAN**, a town of Ireland, in the county of Armagh, situated in a flat tract at the northern end of the county, 2 miles from the south shore of Lough Neagh, 17 miles north-east from Armagh, and 86 miles north from Dublin. The population in 1881 was 10,184. The town contains a handsome church, Roman Catholic chapel, nunnery, Presbyterian meeting-houses, and Methodist chapels, some breweries, a tobacco manufactory, and several factories; also a union workhouse, a court-house, in which petty sessions are held, and an Orange Hall erected in 1871. There is a hall for the sale of diapers and linens, which is largely attended. The town has progressed greatly during the last twenty years. For cleanliness and regularity Lurgan is not surpassed by any other inland town. There is a large cemetery, beautifully laid out. The appearance of the town and vicinity is greatly improved by the adjacent demesne of Lord Lurgan, to which strangers have access.

**LUSTRATION** (Gr. *luo*, I wash), among the ancients, a mode of purification by sacrifices and other religious ceremonies. The initial ceremony seems always to have been the sprinkling of the place or people with water scattered from an aspergillum, or from a laurel or olive branch, followed by the burning of some sweet-smelling incense. Hence the early Christians derived their use of holy water and incense, though they afterwards attached meanings of their own to these usages. Thus they were accustomed to purify their cities, armies, or people, after any impurity or crime; and the Romans also purified their fields after the harvest and their sheep after the lambing season. Then was it that they sang the hymn of the *Fratres Arvales* (the Field Friars), the oldest monument of the Latin language. [See LATIN LANGUAGE.] The Roman armies also underwent sprinkling with holy water before entering on a campaign. There was scarce any action performed, at the beginning and end of which some lustral ceremony was not required, to purify themselves and appease the gods.

**LUSTRE OF MINERALS** is one of the characteristics resorted to as aid in recognizing and describing the different mineral species. It is produced by the reflection of light from the surface, and is of course affected by the nature of that surface. There is no means of judging lustre accurately, it is altogether a matter of appreciation of the eye; but several varieties and degrees of intensity are recognized, which can be best judged by reference to the minerals which are taken as typical examples. The most important are:—

(1) *Metallic*, or that possessed by native metals and some minerals, as galena and iron pyrites.

(2) *Vitreous or glassy*. This is well displayed by quartz and rock-salt.

(3) *Resinous or waxy*, as in zinc-blende and amber.

(4) *Pearly*, as in talc and selenite.

(5) *Silky*. This is generally seen in fibrous forms of minerals, as in asbestos, some forms of selenite, &c.

(6) *Adamantine*, as in the diamond.

The degrees of intensity recognized are:—

(a) *Splendent*, when the surface reflects objects distinctly, as in well-formed crystals of zinc-blende.

(b) *Shining*, when the reflection is less distinct.

(c) *Glistening*, when the light is well reflected, but without an image.

(d) *Glimmering*, when there is only a feeble reflection of light.

(e) *Dull*, when there is a total absence of any shine, as in chalk and most amorphous minerals.

**LUSTRUM** was the name applied to a period of five solar years among the Romans, as the termination of this period was generally marked by a public lustration after the taking of the census was over.

It is well known that the most ancient Roman year consisted only of ten months, or 304 days, and that this year continued to be used for religious purposes. Niebuhr has shown that at the *lustrum* the civil and religious years coincided, since five solar years, containing 1825 days, coincide with six religious years of 304 days each, containing 1824 days, with the difference of one day.

**LUSUS NATURÆ** (Lat., sport of nature), a term applied to a monster or to anything unnatural in the physical world.

**LUTE**, a stringed musical instrument of the guitar family, in which the strings sound by being plucked. Its origin is pointed out by its name, which is the Arabic *ud* preceded by the article, *al ud*. In Portuguese its name is still *alaude*. It was introduced into Europe by the Crusaders.

The main difference between the lute and the guitar is that the body of the former has a beautifully curved back, which one might roughly compare to the half of a somewhat ovoid melon in shape, and the whole body takes an oval, not an elliptical form, the narrow end of the oval being uppermost, and the back starts at once from the soundboard. The guitar, on the contrary, has a much more violin-like outline, and a flat back and soundboard, which are separated by the curving sides of the instrument, perpendicular to both of them. Both lute and guitar have a long neck stretching upwards from the body, so that the strings which pass up to the head, where they are wound round the tuning-pegs, may be "stopped" by pressure against the neck; and one string be made to give out many diverse notes, according to the sounding length of it, as determined by the stopping. This is of course the plan of construction of the violin family also; but the guitar family, including the lute, differ from violins in not having the neck (or "finger-board") smooth. Guitars and lutes have frets across the neck, raised edges of ivory or of metal slips let into the neck and projecting a little above it; and the frets are so placed along the neck as to indicate the places for stopping successive notes in the musical scale of the country. A violinist can play any scale he pleases, and any interval, however small it be; a lutenist can only play in his set scale, and is held to exactitude very nearly as rigidly as a player on an instrument of fixed tones, such as a pianoforte. (The lutenist can vary his tones a little, according as he presses *over* the fret or *behind* it, &c., but the range is not great.) When Villoteau endeavoured to study Arab music, his task among the savants who were sent out from France with the great Egyptian expedition of Napoleon Bonaparte (1798), he was continually foiled by his Arab teacher singing out of tune, while when he repeated the airs on the violin the Arab found the same fault with him. After a period of perplexity, he thought of examining the frets of the native lute, and at once saw that the musical scale of the Arabs is quite different from ours, and we can neither sing to them in tune nor they to us.

The Arab lute came originally from Persia in the sixth century. Its strings, varying in number, are of twisted silk, and the frets are often made by tying pieces of the strings round the neck at the proper places.

The modern Egyptian lute (*oud* or *e'oud*) has seven pairs of gut strings, and is played with a quill plectrum, not with the fingers. But there was a lute-like instrument called *nefr*, with an exceedingly long neck, used by the ancient Egyptians in the most remote antiquity. A piece of wall-painting of the time of Moses, now preserved in the British Museum, depicts a concert of *nefrs*, and the strings and frets of the instruments are well shown. The performers are women, and they play with plectra, apparently of ivory.

The Italian lute was an enlarged and beautified variation of the original Arab copy, and down to the time of Bach, who wrote for it, it was a favourite instrument. Its melon-shaped ovoid body was built up of staves of pine or cedar; the flat soundboard was of pine, and was supported by a soundpost and strengthened by a longitudinal bar, as in the violin; a circular soundhole, or a pattern made up of several soundholes, pierced the middle of the soundboard. The body was relatively large and the neck short. The strings were of catgut; and those which ran along the neck were usually in pairs, four to six pairs being the usual number, each pair being in unison and close set, like the strings of a bichord pianoforte. Beside these were usually one or two large strings, which lay quite outside the finger-board and were attached to a part of the head projecting somewhat sideways; these were tuned to the chief notes of the key, and were not alterable by stopping, sounding always one note. This plan was found so serviceable that it was extended, and the large theorbos and archlutes almost drove the small ordinary four or six stringed lutes out of existence.

The lute required constant tuning; as Matheson laughs, a luteist eighty years old would have spent sixty in tuning his instrument. For amateurs, who paid for the constant repairs and adjustments required, it was said that a lute cost about as much as a horse to keep. These jests show how troublesome the instrument was to keep in order. It was considered advisable to keep the lute in a bed which was constantly used. Their prices were high for those by good makers; in the seventeenth century a first-rate lute, especially if a century old or so, fetched £100, representing a very high sum in our own value of money. The great authority on the lute is Thomas Mace's book (Lond. 1676). The tone of the lute was very thin, expressive, and delicate. It was not only used to accompany the voice, but was the great solo instrument of the middle ages, until superseded by the violin. Its music was written in TABLATURE.

**LUTEOLIN**, the yellow colouring matter of the common weld (*Reseda luteola*, natural order Resedaceæ). It crystallizes in yellow needles, soluble in alcohol and ether, but slightly soluble in water. It is a weak acid, and combines with alkalis, forming salts of a deep yellow colour. The formula is  $C_{20}H_{14}O_6$ .

**LUTHER, MARTIN**, or **LUDDER, LUTTER**, or **LOTHER**—for he signed his name in all these various ways—was born at Eisleben, in Lower Saxony, on the 10th of November, 1483. When six years old he was sent to the free school at Eisenach, and to gain his daily bread was wont to solicit alms by singing before the houses of the rich and charitable, a custom both then and at a later time with the poor students of Germany. "Let no one," says the great reformer in one of his works, "speak contemptuously in my presence of the poor fellows who go from door to door, singing and begging bread *propter Deum*! You know the psalm says, 'Princes and kings have sung.' I myself was once a poor mendicant, seeking my bread at people's houses, particularly at Eisenach, my own dear Eisenach!"

His father's circumstances improving—the elder Luther

was a miner, and in possession now of two furnaces of his own—it was determined that the youthful Martin, already giving evidence of an active and powerful mind, should study the law, and he was entered in 1501 at the University of Erfurt, in Thuringia. For legal pursuits, however, he showed no appetite; his intellect swept away at once the cobwebs and trickeries of the law, and he devoted himself to the study of *belles lettres* and music. Music throughout life was his favourite art; he taught it to his children, he ranked it next to theology, and was accustomed to say of it, "Music is the art of the prophets; it is the only other art which, like theology, can calm the agitations of the soul, and put the devil to flight."

Dividing his attention between the classics and the writings of the schoolmen, young Martin Luther strode forward in his career. At the age of twenty he was honoured with the title of Master of Arts, and then, by the advice of his kinsmen, he began to apply himself to jurisprudence. In the Augustinian monastery at Erfurt, which he joined in July, 1505, he excited general admiration in the public exercises by the facility with which he extricated himself from the labyrinths of dialectics. He read assiduously the prophets and the apostles, then the books of St. Augustine—his "Explanations of the Psalms," and his book on the "Spirit and the Letter." He studied with earnestness the writings of Occam, whose logic he preferred to that of Duns Scotus and Thomas Aquinas.

An accident, as the world would call it, determined his future career. He saw one of his friends killed by lightning at his side. He resolved thereupon to dedicate himself to God's service, and entered upon a life of the most rigid self-denial. "If," he says, "Augustine went straight to heaven from the walls of a monastery I ought to do so, as all my brethren would testify. I fasted, I watched, I practised all the austerities of a cenobite, until I absolutely fell very ill." But as yet, like John Bunyan, he was wandering in the wrong path, and soon he was beset with doubts and fears which wrung his very soul. He lingered long in the valley of the shadow. Often might he be seen at the altar foot, with clasped hands and streaming eyes, declaring himself "the chief of sinners." He kept weary vigil throughout the night, wrestling with temptations which sprang from his diseased imagination. "Jerome and other fathers," he afterwards wrote, "never endured such trials. Augustine and Ambrose, too, had their sorrows, and trembled before the sword; but what is this compared with the angel of Satan, 'who strikes with the fists?' If I live I will write a book on temptations, for without a knowledge of the subject no man can thoroughly comprehend the Holy Scriptures, or feel the due love and fear of the Lord."

A weak mind gives way before these inward struggles; a strong mind, after much buffeting to and fro, rises out of them a conqueror; and Luther was reserved to accomplish a glorious mission—to open up to the intellect of Europe, like Columbus, a new world.

In his twenty-third year the business of his monastery called him into Italy. The journey opened up a new era, not only in Luther's life, but in the history of religion; for the shams and falsehoods and open vices of the Italian capital disgusted his clear moral sense and offended his vigorous intellect. He penetrated into all the mysteries of the papal court, and beneath its flowers and gilding recognized the abomination of iniquity that corrupted the church and society. So, with thoughts arising in his heart that were to prove the germs of a great revolution, he quitted the city of the popes, and shook the dust off his feet.

On his return to his convent solitude he devoted himself to the study of the Scriptures, reading them with the assistance of Erasmus, whose interpretation, however, did not always satisfy him. His renown as a scholar now obtained him the chair of professor of philosophy in the uni-

versity which Frederick the elector of Saxony had founded at Wittenberg (1508). Here he addressed himself to a full and lucid exposition of the divine word, and enunciated opinions which, though as old as the days of the apostles, fell upon his startled hearers with all the effect of novel truths. So long, however, as his doctrines were promulgated from the professorial chair they exercised but little influence, because they were confined to a limited audience; but through the influence of Staupitz he passed from the chair to the pulpit, and flung out his genius upon the multitude. Crowds flocked to hear this bold and original teacher, who spake as man had never spoken since the age of the primitive fathers, and who put new life into the dry bones of an antiquated theology. He had not yet, however, stepped forward as the reformer. His foot was on the threshold, but custom and traditional influences still held him back. His mind required an external impulse to assist it in throwing off its fetters, and this impulse was afforded unwittingly by a Dominican monk named Tetzel. The resources of the Roman see proving inadequate to the accomplishment of the many ambitious projects which filled the teeming brain of Pope Leo X., chief among them being the ardent desire to complete St. Peter's at Rome, he resolved to increase them by the sale of indulgences.

Luther was struck with amazement and horror at this proceeding. "When I beheld," he says, "this unholy and detestable traffic taking place in open day, and thereby sanctioning the most villainous crimes, I could not, though I was then but a young doctor of divinity, refrain from protesting against it in the strongest manner." He thundered resolutely against the monk and his mission; Tetzel retorted; Luther, growing bolder in the cause, stepped into the arena, armed at all points. On the 31st of October, 1517, the eve of All Saints, he nailed to the church door ninety-five theses against the doctrine of indulgences, and announced his readiness to defend them. A copy found its way into the hands of Tetzel, and excited his alarm and indignation. He published 106 counter-propositions, in which he asserted the Pope's infallibility, and branded Luther and all who abetted him as heretics and heresiarchs. The discussion spread. The introduction of printing and the consequent diffusion of books had already awakened a spirit of inquiry, and the people threw themselves with eagerness on the religious pasture from which they had been so long excluded. Luther's theses were printed in thousands, devoured, and circulated in every direction, so that even their author was alarmed at his success. He was not yet prepared to throw off the authority of the Pope, and at this juncture seemed disposed to abandon the whole matter. But his pacific resolve was shaken by Tetzel, who had burned the heretical theses in public, and as it were, dared Luther to the conflict. The inhabitants of Wittenberg retaliated by consigning Tetzel's productions to the flames in the Great Square, and thus began the great religious revolution known as the Reformation. Several others joined in the chase which Tetzel had started; John Eck, Prierio, and Hoogenstraten opened upon him in full cry. At first the commotion was viewed with indifference at Rome. "Monkish jealousy," cried Leo X.; "this friar Martin is a man of fine genius!" And when Luther appealed to him against the lawfulness of indulgences, he privately requested his friend Staupitz to persuade the reformer to rest in peace. But when at length the Pope's master of the ceremonies wrote a defence of Tetzel, and Luther published a masterly reply, the alarm and ire of the papal court were fully aroused. He was summoned to appear at Rome within sixty days, and Prierio, one of his strongest antagonists, was placed at the head of the tribunal appointed to try him. But the Elector of Saxony, who was favourable to Luther, knew well that if he ventured to Rome he ventured into a lion's

den from which there was no hope of return, and demanded of the Pope that the German monk should be tried in his own country. His influence procured the concession that he should be examined by a legate in the free town of Augsburg, where the elector himself was then residing. With the courage born of faith Luther proceeded thither, journeying on foot, without a kreutzer in his pocket, and in a worn-out gown. At the gates of Augsburg he was received by a crowd of priests and laymen, rich and poor, who welcomed him in God's name. Before the legate, Cardinal Cajetan, he preserved his wonted composure, and defended his convictions with earnest eloquence. The cardinal called upon him to retract, or threatened him with the vengeance of the church. A four days' dispute ensued, in which the reformer's arguments proved irresistible, and Cajetan broke up the examination in great disorder. The monk returned in safety to his cell and his pulpit. "I leave the place," he wrote to the cardinal, "in the name of the Lord, and I appeal from Leo misinformed to Leo better informed." Between Luther and the papal court reconciliation was henceforth impossible, and it was well for him that he had secured the protection of a patron so powerful and so sincere as Frederick of Saxony.

Day by day the breach widened. Luther still retained that feeling of deference towards the church which springs from tradition and prescriptive authority, and to sunder the tie that bound him an external impulse was again necessary. "It was at this time that John Eck put forth a public challenge to Luther to dispute with him at Leipzig. Thither proceeded the reformer, accompanied by Carlstadt, Melancthon, and a large body of students. A fierce debate ensued, in which logic was on Luther's side and authority on that of Eck. But unhappily for the Pope the course of the discussion led the Wittenberg professor to examine the papal claims to the primacy, and he soon found reason to assume a bolder tone and adopt a more vigorous course. Through the printing press he appealed to the people, and his voice stirred the heart of Germany like a trumpet. In October, 1520, he issued his indictment against the papacy in a work of great power and furious invective, entitled "The Babylonian Captivity of the Church." He set forth that the church was held in bonds, and that the Saviour, constantly profaned in the idolatry of the mass, and scornfully disregarded in the dogma of transubstantiation, was virtually the Pope's prisoner. A bull of excommunication arriving from Rome stimulated him to further onslaughts. He immediately issued a pamphlet "Against the Execrable Bull of Anti-Christ," and on the 10th of December publicly burned the papal anathema at the gates of Wittenberg, with the canon law, the decretals, and the extravagances of the popes, exclaiming—"As thou hast afflicted the holy of the Lord, so mayest thou be consumed in everlasting fire." In an address he added—"Hitherto I have merely jested with the Pope; the serious struggle now begins." And from that date Luther held no more communion with the Church of Rome.

The circumstances of the time, as we have said elsewhere, proved eminently favourable to the success of Luther's mission. The discovery of printing had aroused the intellectual faculties of men, while it provided the means of supplying them with the nutriment they so long had lacked. The printers, necessarily men of bold and quick intelligence, became Luther's most powerful and enthusiastic supporters. They frequently printed his books at their own cost, and always with a loving care. Vast numbers of copies were struck off, and rapidly distributed throughout Germany by those heretical monks who had thrown aside their cowls and returned to the world to promulgate the principles of a reformed creed. The fire was latent in the earth, and as the vivifying flame passed quickly from one point to another, it burst forth in all its

brilliance, lighting up the civilized world with the reflection of its radiance. The nobles and the peasantry, the castles and the free towns, feudalism and commerce, rivalled each other in enthusiasm for Luther. At Marienburg, at Strasburg, even at Mainz, there prevailed a constant struggle for his smallest pamphlets. The sheet, while yet wet from the press, passed from eager hand to hand. The literary guilds then flourishing in Germany, thimble and shoemakers, braziers and tailors, greedily devoured the good tidings proclaimed by the reformer. Hans Sachs, the shoemaker poet, celebrated in his most melodious strains the "Nightingale of Wittenberg," and the song, as it spread over all the German land, swelled into the trumpet-tones of a victorious psalm. The German nobles were foremost in this new communion of thought and sentiment. They supported the hero-reformer with money; they promised him active aid against all assailants. "I see very clearly," wrote Ulrich von Hutten, "that we must come to swords, bows, armour, and cannon. Do thou, my father, fortify thy courage, and despise these wild beasts. I see each day the number of thy adherents augment; thou wilt be in no want of defenders." The friends of Luther were even present in the Diet at Worms, and in one of the sittings a paper was produced which set forth that 400 nobles had sworn to defend him, and he who read it cried aloud—"Buntschuh! Buntschuh!" the war-cry of the insurgent peasantry.

Charles V., king of Spain, had been recently elected emperor, and crowned at Aix-la-Chapelle, and his first Germanic Diet was summoned to assemble at Worms in 1521, with the avowed object of checking the progress of the new and dangerous opinions. The papal party, headed by Alexander, prevailed upon the young emperor to issue an edict for the destruction of Luther's writings. The States, however, refused to publish the decree unless the reformer were heard in his own defence, and a safe-conduct granted him under which he might repair to Worms. His friends would have had him disregard the imperial mandate, but Luther was wiser and bolder, and seized the opportunity of proclaiming the truth before the great German council. His journey to Worms resembled a triumphal procession. When he came in sight of the city, on the 16th of April, he rose in his chariot and chanted the noble psalm—the "Marseillaise of the Reformation"—*Ein feste Burg ist unser Gott* ("A safe stronghold our God is still"). Before the Imperial Diet he maintained the same sublime confidence in the help of heaven, and expounded his doctrines with all the eloquence of a vigorous and truth-fearing soul. Neither promises nor threats could induce him to retract. "The word of God," he said, "is not my word, and I cannot abandon it. Here am I," he exclaimed; "I cannot do otherwise; so help me God. Amen!"

On the 26th of April he left Worms. An imperial edict was straightway issued against him, and all persons were prohibited from affording him any assistance or asylum, under penalty of high treason. As the only mode of saving his life, the friendly elector caused him to be arrested when on his way to Alterhausen, and provided for him a secure abode in his castle of Wartburg, where he was safe from the persecution of his sanguinary foes. He spent a year in this solitude, lamented by those of his friends who were not in the secret of his concealment, and occupied his time in a portion of his great work—the translation of the New Testament into German. The version was published in 1522. But his secluded and sedentary life filled him with morbidly nervous sensations. He imagined himself to be troubled with the frequent presence of the Evil One, in the form of a buzzing moth; and they still show the pilgrim to Wartburg the black mark on the wall which records the flight of an inkstand hurled at the intruder by the reformer's vigorous hand. He soon, however, shook off these wild delusions, and learning that Carlstadt and the more

violent reformers were proceeding with such intemperance as to damage their cause, he left the castle in March, 1522, and returned to Wittenberg. His influence and his energy speedily stilled the commotion that had arisen.

In the middle of the same year, Henry VIII. of England entered the lists of polemical controversy, and published a reply to Luther's "Babylonish Captivity." The grateful Pope rewarded his royal ally with the title "Defender of the Faith" (*Fidei defensor*), still borne by English monarchs. The reformer answered with his wonted vehemence. In 1525 he still further asserted his independence of the Roman Catholic Church by marrying a nun, Catherine von Bora, who had escaped from her convent about two years before. She was descended from a noble family, was twenty-two years old, and of a handsome person. Though tried by the miseries of extreme indigence, the union proved a happy one, and Luther found in his wife a helpmate and a consoler. Four children were born to him, and in his domestic relations the reformer showed himself endowed with a heart as true and tender as his intellect was bold and aggressive.

From this time forward the life of Martin Luther flowed on with the fulness and steadiness of a great river. His labours were incessant, for work was the necessary condition of his active spirit. The publication of his German version of the Scriptures was not only an epoch in the history of religion, but in the formation and development of the German tongue. By the year 1583 seventeen editions of it were published at Wittenberg, thirteen at Augsburg, thirteen at Strasburg, with reprints at Erfurt and Leipzig. The bread was freely cast upon the waters, and was eagerly sought. Many of the German states embraced the Lutheran creed, and its apostle found himself called upon to organize and superintend the new churches that sprang up around him. From 1517 to 1526 a book or tractate from his pen marked every year, and he wrote able and learned commentaries on nearly all the books of the Bible. In 1525 a council was held at Augsburg, which adjourned to Spire in 1526, and at it a general council was demanded. In 1529 a Diet was assembled at Spire, which determined on suppressing by force the further promulgation of the reformed doctrines. Against this intolerance several of the German princes, and the deputies of fourteen imperial towns, solemnly protested, and hence arose the appellation of Protestants, which has ever since been borne by the members of the Reformed Church.

At this period occurred the famous controversy as to the Real Presence of the body and blood of Christ in the Eucharist. On this point Luther still clung to a modification of the Romish dogma of the Saviour's actual presence (transubstantiation), and to all arguments replied, "This is my body." The discussion had no profitable result, but excited much ill-feeling between Luther and the Swiss reformers, who stoutly opposed his doctrine of "consubstantiation."

In 1530 was held the memorable Diet of Augsburg, at which the Confession of Faith prepared by Melancthon was formally accepted, and Protestantism, from the dream of a solitary monk, rose to the dignity and substance of a national creed. It was immediately followed by an assemblage of the Lutheran princes at Smalcald (31st December, 1530), where they entered into a mutual league of defence, and agreed, if necessary, to maintain their religious opinions by arms. The Smalcaldic League was the first movement of the Thirty Years' War, which, in the course of its desolating career, brought all Europe within its influence, until the Treaty of Westphalia secured the rights and liberties of the European States.

To the excesses of the Anabaptists it is unnecessary to allude, except in record of the sorrowful indignation with which they filled the soul of Luther. The reformer continued at his labours, earnest and resolute, till, in his



sixty-second year, his health began to succumb. On the 23rd of January, 1546, he repaired to Eisleben to effect, if he could, a reconciliation between the counts of Mansfeldt. In this labour of love he succeeded—a fitting conclusion to his great and glorious career. On the 17th of February he complained of severe ailments in the chest, and became so ill that a conviction of speedy death forced itself upon his mind. He passed an uneasy night, and on the following day gradually sank. "Friends, I am dying," he said to the anxious faces that thronged his chamber; "I shall remain with you at Eisleben." He repeated fervently the prayer, "Into thy hands I commit my soul; thou hast redeemed me, O God of truth!" "Reverend father," said his physician, "do you die steadfast in the faith that you have taught?" Not a doubt flung its shadow upon his soul in that supreme moment, and in a tone of indescribable earnestness, he answered, "Yes." He then fell asleep, and in a few minutes, breathing one deep sigh, surrendered his spirit to God. His remains were conveyed in a leaden coffin to Wittenberg, and interred on the 22nd of February with the highest honours. A most elaborate memorial to him and his principal fellow-workers was erected at Worms in 1868.

"Luther's face," says Carlyle, "is to me expressive of him; in Krausch's best portraits I find the true Luther. A rude plebeian face, with its huge crag-like brows and bones, the emblem of rugged energy; at first, almost a repulsive face. Yet in the eyes especially there is a wild, silent sorrow; an unnameable melancholy, the element of all fine and gentle affections; giving to the rest the true stamp of nobleness. Laughter was in this Luther; but tears also were there. Tears also were appointed him; tears and hard toil. The basis of his life was sadness, earnestness. In his later days, after all triumphs and victories, he expresses himself heartily weary of living; he considers that God alone can and will regulate the course things are taking, and that perhaps the day of judgment is not far. As for him, he longs for one thing—that God would release him from his labour, and let him depart and be at rest. They understand little of the man who cite this in discredit of him! I will call this Luther a true, great man: great in intellect, in courage, affection, and integrity; one of the most lovable and precious men. Great, not as a hewn obelisk, but as an alpine mountain—so simple, honest, spontaneous, not setting up to be great at all; there for quite another purpose than being great! Oh, yes! unshakable granite, piercing far and wide into the heavens; yet in the clefts of its fountains, green beautiful valleys, with flowers! A right spiritual hero and prophet; once more, a true son of nature and fact, for whom these centuries, and many that are to come yet, will be thankful to heaven!"

Luther's character had in it much of the heroic. He was not to be cowed by dangers, not to be daunted by obstacles; these to his ardent spirit were but incentives which stimulated him to greater efforts. He was fond of the clash and clang of battle. It was in moments of extreme peril that he felt all the depth and power of his great soul, and knew of what grand deeds he was capable. At the first sound of conflict his spirit rushed to arms, "eager for the fray." The blows he dealt were heavy, crushing, irresistible, for he was held back by no false sentiment; and when a sham was to be exposed, or a falsehood destroyed, his arm had a giant's might. Yet his was a heart of infinite tenderness, and in his family affections and his friendships he showed himself generous, forbearing, loyal. It is true the gold was not without alloy. There was a certain ruggedness about his nature which could not but offend the dilettante lovers of "rose-water revolutions;" but take him for all in all, and it may well be doubted whether the last nineteen centuries have seen a nobler man.

For authorities, consult "Luther's Works," of which the

best editions are those of Wittenberg, in nineteen vols. folio, with a life of Luther by Melancthon (1539-58); Walch's edition, in twenty-four vols. 4to (1740-53), re-issued with enlargements, in sixty-seven vols., Ger. (1826-57), and twenty-three vols., Lat. (1829-61); and the Frankfurt edition, recently issued at the expense of the Prussian government; D'Aubigne's "History of the Reformation" (English translation, 1845-47); Hanke's "History of the Reformation" (English translation, 1845-47); Seebohm's "Era of the Protestant Revolution" (1877). Among the lives of Luther may be mentioned those of Mathesius (1566), Michelet (English translation, 1846 and 1862), Croly (1857), and lastly, that of Julius Köstlin (two vols., 1875). A popular edition of the last, abridged and illustrated, was issued in one vol. in connection with the Luther festival held in Germany in 1883, and an English translation appeared in London in 1884.

**LUTHERANS**, a term originally applied by the Roman Catholics to those who sided with the reformers of the sixteenth century, but which was afterwards accepted as a title by that section of Protestants who adopted the principles of Luther, in opposition alike to the Roman Catholics, the Swiss Reformers, and the numerous sects which afterwards arose. During the lifetime of Luther serious controversies arose as to the definitions of the terms law and gospel, and as to the doctrine of the Real Presence; while, after his death, other conflicts arose, which ended in the separation of the Protestants into two great divisions, known respectively as the *Lutheran* and the *Reformed*. Luther's friend and lieutenant, Melancthon, though he remained on good terms with the reformer until his death, yet differed with him concerning the doctrine of consubstantiation, and inclined more towards the teaching of Calvin, in which he was followed by a large number of the adherents of the Reformation. Others, more Lutheran than Luther himself, clung with desperate tenacity to the more extreme expressions and teachings of the reformer, which they regarded as a precious deposit left in their charge, to be defended and preserved inviolate against all comers. The University of Jena formed the headquarters of this party, Wittenberg being the centre of the Philippists, or Crypto-Calvinists, as the followers of Melancthon were called. Notwithstanding the obvious evils arising from disunion in the face of an active and determined enemy, few controversies have been conducted with more bitterness than the sacramentarian controversy, and at one time it seemed as if Protestantism was about to fall to pieces from internal discord alone. Numerous theological conferences were held with a view of settling the dispute and arriving at some common form of expression which should unite all parties, but theologians as a class are a somewhat stiff-necked race, and when in 1577, after much discussion and negotiation, the "Form of Concord" was published, it was accepted by some of the Lutheran churches, first adopted and then rejected by some others, and rejected from the outset by many. Those who accepted it became known as the Lutheran churches, while those who rejected it became, for the most part, either Reformed or Calvinist. Many attempts were made during the seventeenth century to unite the two sections of Reformed and Lutheran without success; but at the beginning of the nineteenth century the matter was taken in hand by the civil governments of Germany, and the union of the two churches was effected in Prussia and Nassau in 1817, in Hesse in 1823, and in Anhalt-Dessau in 1827. The name taken was that of the United Evangelical Church, those who refused to consent and separated themselves taking the title of the Old Lutherans. For a time the separatists were treated with considerable severity by the different governments, but ultimately toleration prevailed, and the Old Lutherans have since formed a recognized ecclesiastical body in Prussia.

In theology the Lutheran churches recognize the supreme



authority of the Bible, but their chief doctrinal standard is found in the AUGSBURG CONFESSION, already noticed in this work. In opposition to the Calvinistic churches, the Lutherans maintain the doctrine of consubstantiation, and they retain in their public worship the use of vestments, pictures, images, the formula of exorcism in baptism, and other practices similar to those of the Roman Catholic Church, but which are rejected by the majority of Protestants elsewhere. In Denmark and Sweden there are bishops appointed in the Lutheran churches, but in most other places the civil power is recognized as the supreme authority, the affairs of the churches being conducted by means of consistories composed of ministers and laymen, who are appointed by the government.

**LUTIDINE**, an organic base obtained from bone oil. It is a colourless oil, soluble in water, having a specific gravity of 0.9467, and boiling at 164° C. (309° Fahr.) It is a strong base, forming numerous salts, which are crystalline and soluble in water.

**LUTON**, a town of England, in the county of Bedford, is pleasantly situated near the west bank of the river Lea, not far from its source, 14 miles south by east from Bedford, and 32½ from London by the Great Northern Railway. It is the chief seat of the straw-plait and bonnet manufacture in the United Kingdom, and on this account the population increased from 7740 in 1841 to 17,821 in 1861, and to 23,960 in 1881. The number is subject to fluctuation, in consequence of the changes of fashion causing depression or revival in the trade. The proportion of females to males is at least five to three. The factories in which the manufacture is carried on are of great size. There are a town-hall, corn exchange, court-house, and a plait-hall. The parish church is an interesting specimen of Gothic architecture, with a square embattled tower surmounted at the angles by hexagonal pinnacles, and a handsomely decorated west door: the interior contains, besides some painted windows, a curiously carved font, and some fine old monuments. It is of the fourteenth century, and was restored in 1865.

**LUTTERWORTH**, a small market-town of England, in the county of and 14 miles S.S.W. of Leicester, and 94 miles from London. The church, a large handsome building, restored in 1870, contains a portrait of its famous rector, the reformer Wyclif (who died here in 1384), and a part of his pulpit. In 1415 the Council of Constance endeavoured to gratify their rage against his memory by ordering his remains to be disinterred and cast upon a dunghill. This disgraceful sentence was carried into effect; for the bones of Wyclif being taken up were burned, and the ashes thrown into the Swift. "Thus," as Fuller has ingeniously expressed it, "this brook (the Swift) has conveyed his ashes into Avon, Avon into Severn, Severn into the narrow seas, they into the main ocean; and thus the ashes of Wyclif are the emblem of his doctrine, which now is dispersed all the world over." The town is on the Swift, a tributary of the Avon.

**LÜTZEN**, in Germany, a small town in Prussian Saxony, in the government of Merseburg, 9 miles south-east of Merseburg, on the Elster River Canal. The population is about 3000. It contains a church and a small castle, but no public buildings of importance, nor any manufactures. Its interest is purely historical, and derived from the great battles of which the neighbouring plain has been the scene. A recent writer describes this plain as a rich expanse, studded with villages and tall ungainly church steeples; here and there, bedded in the soil, is one of those problematical boulders of dark red granite which the glaciers transported hither, according to modern belief, from distant Scandinavia, and which now chiefly serve as landmarks; far in the south the first blue outlines of the Erzgebirge faintly show themselves. This vast level has been the battlefield of Northern Germany from the earliest historic times. Here

or in the immediate neighbourhood, Henry the Fowler defeated the Huns in 934. Here were fought the two battles of Leipzig or Breitenfeld, in the Thirty Years' War. Here Gustavus Adolphus fought and died, on the 6th of November, 1632, for the great cause of civil and religious liberty. And here Napoleon was repulsed by the allied armies in 1813. Not an ear of corn is pure from the blood of men.

"Lützen," says Mr. Herman Merivale, "is a thoroughly old-fashioned, forgotten-looking town, with walls and fosse partially preserved, and the open country on all sides extending close up to them. It has now about 500 houses, and is traditionally reported to have been more considerable in olden times." About three-quarters of a mile beyond the town, on the Leipzig road, stands a rough mass of porphyritic stone—the Schwedenstein or Swede's stone. It commemorates the death of the great Protestant hero, Gustavus Adolphus, who fell close to the spot where it stands. It bears the inscription "G. A., 1632," is surrounded with a little shrubbery and gravel walk, and surmounted by a Gothic arch of cast iron.

The battle in which the Swede king fell may be said to have secured the liberties of Protestant Germany, while it crushed the pretensions of Austria to the supremacy of Europe. The Swedish, or rather allied army, for it included English, Scotch, and Germans in its ranks, consisted of about 25,000 men; the Imperialists, under Wallenstein, duke of Friedland, numbered 20,000, while at Halle, 16 miles to the north-west, lay Pappenheim with 16,000 men, the greater portion of whom he brought upon the field in the course of the struggle. The attack was delivered by the Swedes about eleven o'clock, and the fight continued with varying fortune until night closed over the conquerors and the conquered. Both sides fought desperately, but the superior discipline and religious enthusiasm of the Swedes prevailed, and the Austrian army was almost annihilated.

Gustavus was slain early in the battle. Wounded in the shoulder by an Austrian trooper, he fell from his horse with a groan, and his page, Lobelling, being unable to lift him again on his charger, he lay exposed to the enemy's cuirassiers. Some of these riding up fired a pistol through the hero's head, and terminated his short but glorious career in the thirty-ninth year of his age. His memory is still very much cherished in Germany.

The second great battle of Lützen was fought in 1813, between the French army, commanded by Napoleon in person, and the allies, under the Emperor Alexander, Blücher, Moreau, and Schwartzemberg. Napoleon, after a desperate struggle, was compelled to retreat.

**LUXEMBURG**, formerly a grand-duchy in the Netherlands, but now divided between Holland and Belgium, is bounded E. by Prussia, N. by Liège, W. by Namur, and S. by France. DUTCH LUXEMBURG, which gives the King of Holland the title of grand-duke, and conferred on him a vote in the old Germanic Confederation, lies east of Belgian Luxembourg, and has an area of 998 square miles, with a population in 1880 of 209,570. BELGIAN LUXEMBURG is the largest and more western part of the former grand-duchy; it has an area of 1690 square miles, with a population in 1883 of 211,165. The principal rivers of Luxembourg are the Moselle, the Sûre, and the Our, which form the boundary between Dutch Luxembourg and Prussia; the Elze or Alzette, a feeder of the Sûre; the Semois, which rises near Arlon, and flows west into the Maas; the Ourthe, which rises near Bastogne, and falls into the Maas near Liège; the Lesse, which rises near Neufchâteau, and falls into the Maas near Dinant.

Luxemburg is crossed from south-west to north-east by a range of high ground, part of the Ardennes, which separates the valley of the Maas from that of the Moselle. The soil of this elevated region is calcareous, and is principally occupied as pasturage. The lower lands are very produc-

tive, and yield abundant harvests of wheat, rye, flax, hemp, mangel-wurzel, &c. Such of the high lands as are tilled rarely yield anything but rye, oats, and potatoes. Large forests are found in many districts. Agriculture is in rather a backward state. The vine is cultivated on the banks of the Moselle and the Sûre. The quality of the wine is inferior. In Dutch Luxemburg there are a great number of distilleries and some iron-works. Horses, horned cattle, swine, and sheep are numerous. The former are much prized for agricultural and military purposes. The latter are exported in large numbers. In the Belgian province there are iron-works, slate quarries, potteries, tanneries, cloth and paper mills. Iron and lead mines are worked; copper is also found.

Up to 1866 Dutch Luxemburg was connected with the old Germanic Confederation, and in consequence of this the Federal fortress in the city of Luxemburg, which was of immense strength, was garrisoned by a large Prussian force. After the dissolution of the Germanic Confederation, subsequent to the battle of Sadowa, the King of Holland privately sold the territory to the Emperor of the French; but the Prussians, who wished it to be annexed to the North German Confederation, and very strongly objected to France obtaining possession of such a strong fortress close to their country, declined to evacuate the city, and at one time a war on the subject between France and Prussia seemed imminent. This was fortunately averted by a conference of the great European powers, which took place in London, and at which it was agreed that the sale to France should be ignored, that the Prussians should retire, and that in future the territory should be strictly and perpetually neutral, although in other respects under the King of Holland. The fortress has since been dismantled.

LUXEMBURG, the capital of Dutch Luxemburg, stands partly on level ground on the banks of the Alzette, and partly on a scarpd rock, 200 feet high, which is reached by flights of steps and zigzag streets. The grandeur of the scene is considerably enhanced by the vast viaducts of the railways to Trèves and Diekirch, and the colossal Petrus viaduct, which spans the ravine between the railway station and the south side of the Oberstadt. The fortress on this rock was regarded as perhaps the strongest place in Europe after Gibraltar. The fortifications were condemned to demolition in 1867, but most have been left standing on account of the great expense attending their removal. It has manufactures of linen, gloves, cotton, leather, &c., a public library, atheneum, and museum. The population is about 16,000.

**LUXOR.** See THEBES.

**LUXUL'IANITE** is a variety of granite in which the mica is replaced by schorl or tourmaline. This rock consists of a ground mass of black schorl, in which are embedded grains of quartz and large crystals of orthoclase. It is a highly ornamental stone, and takes a good polish; from it the sarcophagus of the late Duke of Wellington is made. The stone occurs in the vicinity of Luxullian, Cornwall; hence the name, but it has not been found there *in situ*.

**LUZERN'.** See LUCERNE.

**LUZON'**, the largest and most northerly of the Philippine Islands, is of a very irregular form, and with shores rocky and deeply indented. It is about 450 miles long by 10 to 140 broad. The interior is occupied by mountains, which attain 6000 or 7000 feet elevation, and are covered with luxuriant forests, producing useful and ornamental woods. There are many fine valleys and rich plains; and among the numerous valuable products are rice and tobacco, extensively grown; indigo, coffee, cocoa, sugar, and wax; also gold, iron, copper, and rock-salt. There are many volcanoes and volcanic products, but granite and the old slates and tertiary formations have been observed to occur, and coal has also been found. The capital is

Manilla. About 2,500,000 of the people, inhabiting an area of about 80,000 square miles, are subject to Spain. The whole area is 42,794 square miles. The population is about 4,000,000.

**LYCABETTUS** (Gr. *Lukabéttos*), a mountain of the range of Pentelieus (*Pentelikos*), which forms a striking feature in the view from Athens, coming down close to the north-east of the city, on the left of the Marathon Road. [See Plate **ATHENS**.] The name is sometimes erroneously given to the small hill north of the Pnyx (*Pnyx*).

**LYCÆNIDÆ.** See BUTTERFLIES, HLAIRSTREAK.

**LYCAN'THROPY** (Gr. *lykos*, a wolf, and *anthrōpos*, a man), a term used to indicate the belief that men in certain circumstances are transformed into wolves or other animals. This belief can be traced back to the most remote periods, and it is found in full strength among most savage peoples, and as a lingering, decaying tradition in many civilized nations at the present day. During the middle ages, and so late as the beginning of the seventeenth century, it was a fixed belief, even among educated people, that certain witches or wizards were able at will, by the use of a certain ointment, girdle, or charm, to transform themselves into wolves, and that it was their practice to do so in order that they might feast upon human flesh. Not only so, but many persons were arrested on the charge of having committed this crime, and after trial were executed for the offence. As in the case of witchcraft, it was not uncommon for those arrested to plead guilty, and to give to the court minute accounts of their practices, a circumstance which naturally confirmed the popular belief on this subject. It seems also evident, from the records of these trials, that in some instances the persons arrested evidently believed in their own powers, and under the delusion that they had become wolves had been really guilty of murder and cannibalism. Where this belief prevailed and was accepted without question it is perhaps not very wonderful that insanity should take the form of wolf-madness, or that it should at times assume the form of an epidemic in certain districts, diffusing terror far and wide. It is said that in the early part of the seventeenth century multitudes in the Jura were attacked by the hallucination, and some 600 people were executed on their own confession. It has been observed in those countries of Europe where the belief still lingers among the peasantry, that where wolves prevail men are still regarded as changing themselves into this animal; but in other nations the transformation is believed to take place into that of the animal most dreaded, and men are supposed to become bears, tigers, serpents, lions, leopards, &c. See Barny Gould's "Book of Were Wolves" (London, 1865), and Moneure D. Conway's "Demonology and Devil Lore," vol. i. (London, 1879).

**LYCA'ON.** See HUNTING DOG, CAPE.

**LYCÆ'UM** (Gr. *Lukæion*, so called from its being close to the temple of the god *Apollōn Lukeios*), in Greek antiquity, a famous academy or school situated upon the bank of the Ilissus at Athens. It consisted of several porticoes and numerous open and covered walks, where Aristotle instructed his scholars in the principles of philosophy and logic. As they walked there daily until the hour of anointing, they received the name of *Peripatetics*. In modern usage the term is sometimes used for an educational establishment, as in the case of the French *Lycees*.

**LYCHNIS**, a genus of plants belonging to the order Caryophyllaceæ, and to the suborder Silenææ. *Lychnis Chalcædonica* (the scarlet lychnis) produces scarlet, rose-coloured, or white flowers, and is a great favourite in our gardens. *Lychnis grandiflora* has large beautiful scarlet flowers, and is a native of China and Japan. *Lychnis Flos-cuculi* (ragged Robin) has rose-coloured petals, and is an abundant plant in the moist meadows and pastures of Great Britain, as well as the whole of Europe. *Lychnis*

*respertina* (white campion) is a common plant in the hedge-banks of Europe. This and *Lychnis diurna* (red campion) are sometimes regarded as varieties, and then named *Lychnis dioica*.

**LYCIA**, an ancient province of Asia Minor, was bounded on the N. by Phrygia, on the E. by Pamphylia, on the W. by Caria, and on the S. by the Mediterranean Sea. The interior was almost entirely unknown till the discoveries of Sir C. Fellows, which have corrected the erroneous representations of the maps. The coast is bordered by lofty mountains, but there are no high mountains in the interior. The Xanthus, which has been represented as a small stream, is a river of considerable length, flowing from the mountains in the north of Lycia; and the whole of the interior is a fertile plain, surrounded by mountains, and drained by the Xanthus.

That Lycia was early colonized by the Greek nation is evident, not only from the account of Herodotus, but also from many other Lycian traditions, as well as from the worship of Apollo, which was spread over the country. Xanthus was a Cretan settlement. The chief temple of Apollo was at Patara.

In the time of Strabo the Lycians had a kind of federation consisting of twenty-three cities, which sent deputies to an assembly, in which a governor was chosen for the whole of Lycia, as well as judges and inferior magistrates. All matters relating to the government of the country were discussed in this assembly. The six principal cities, Xanthus, Patara, Pinara, Olympus, Myra, and Tlos, had three votes each, other cities two votes each, and the remainder only one each. In consequence of dissensions between the different cities this constitution was abolished by the Emperor Claudius, and the country was united to the province of Pamphylia.

The country is now well inhabited, chiefly by Turks, many of whom lead a life half settled and half nomadic; they are distinguished by their excellent character. Most of them are farmers or herdsmen; trade is chiefly carried on by Armenians and Greeks, who live in the sea towns, and form the greater portion of the population of the inland town of Almalı, which is the largest in Lycia, the population being about 25,000. The breeding of horses is carried on to a great extent, and herds of many hundreds are often seen grazing together in the valleys. The only kind is that of which such spirited representations are seen in the ancient marbles; the head is of Arabic cast, the chest is very large, the feet are remarkably fine and thin, and the ears as small as in the antique. They are not shod. No part of Asia Minor contains such splendid valleys as those of the Xanthus and the Dolomon Châi. Myrtle, oleander, and pomegranates cover the banks of the rivers; the plains along the rivers are well cultivated, and in many places the fields are inclosed by fences of myrtle and the small prickly oak, mixed with the orange, the wild olive, the pomegranate, the elegant green storax, which are most beautifully matted together by vine, clematis, and many other climbers. The hills are covered with large oaks and planes, which supply excellent timber. The high plain round Almalı, which is 4000 feet above the sea, is one of the largest and best cultivated corn tracts in Asia Minor; its chief produce is barley, which is the common food for horses. Maize is chiefly raised in the valleys and on the coast. The name is still applied to that part of Anatolia which is opposite to Rhodes.

**LYCIUM** was the name given by ancient writers to a substance brought chiefly from India, and used to restrain inflammatory and other discharges, and especially in the treatment of ophthalmic inflammation. This substance was considered very precious, and was sold in singular little vases, specimens of which may be seen in collections of Greek antiquities, with the name of the drug inscribed and of the person who sold it. In 1838 Dr. Royle proved

that this substance was an extract, called Rusot in India, and prepared from the wood or root of various species of Indian Berberis (Barberry), viz. *aristata*, *Lycium*, and *asiatica*. The root-bark of these three species has been made official in the Indian Pharmacopœia. It is tonic, antiperiodic, and diaphoretic, and is valuable in fevers, diarrhœa, and general debility, and also in the form of extract in ophthalmia.

**LYCIUM** is also the name now given to a genus of SOLANACEÆ, of which the species *Lycium barbarum* is well known under the name of Tea-plant. It grows rapidly, and though rather straggling, is often cultivated; it has small lilac flowers, succeeded by scarlet or orange fruit.

**LYCOPODIACEÆ**, a group of CRYPTOGAMIA, chiefly consisting of moss-like plants, inhabiting moors, boggy heaths, and woods in many parts of the world. They never exceed the height or length of 2 or 3 feet, and usually grow prostrate. The spores of *Lycopodium claratum* (Plate III. CRYPTOGAMIA, fig. 21) are sprinkled upon pills to prevent their adhesion. Some of the species, especially *Lycopodium catharticum*, are violent purgatives, and it has been proposed to use others as dyes; but in general they are of little importance to any except the systematic botanist. The large fossils common in the coal measures, and called LEPIDODENDRON, are the relics of an extinct gigantic race of these now pigmy species.

The Lycopodiaceæ are divided into two tribes, Lycopodiaceæ, with only one kind of spore, and Selaginellæ, with two kinds of spores. The former contains four genera, of which one is important and native in Britain, *Lycopodium*; the latter contains two genera, *Selaginella*, commonly grown in our hothouses, and *Isoetes*, a native plant. The Lycopodiaceæ branch in all directions, the Selaginellæ branch in one plane with leaves which are arranged in four rows, and are of different sizes, the upper and lower of smaller leaves than those on the sides. In both adventitious roots are produced. In *Lycopodium* two or more fibro-vascular bundles are combined in the centre of the stem, and surrounded by a sheath of thin-walled cells, and these by other layers of thick-walled cells. In *Selaginella* the bundles are quite distinct from one another, and are surrounded by air cavities. In *Isoetes*, a genus of aquatic plants with slightly developed stem and grass-like leaves (see Plate III. CRYPTOGAMIA, fig. 19), there is an axial woody body, consisting of short vascular cells with spiral markings.

The spores are contained in capsules called sporangia, which are found in the axils of leaves, and burst when ripe. In *Lycopodium*, the portion on which the sporangia are placed forms a spike-like receptacle. In the Selaginellæ, the large spores, which ultimately produce new plants, and the small spores, which fertilize the others, are contained in distinct capsules, macro-sporangia and micro-sporangia.

**LYCOPodium**, a fine mobile, tasteless, inodorous pale yellow powder consisting of the spores of the *Lycopodium clavatum*, or common club moss, natural order Lycopodiaceæ. It is very inflammable, and when blown through a candle burns with a rapid bright flame; it is used in theatres to imitate lightning. The names of Witch-meal and Vegetable Sulphur have been applied to it. It is used in pharmacy for rolling round pills to prevent sticking together, also for dusting infants and excoriated surfaces. It is extremely resinous and repellent, and when sprinkled on water, on which it floats, the hand can be dipped into it without wetting it.

**LYCOSIDÆ**. See WOLF-SPIDER.

**LYCURGUS** (Gr. *Λυκουργος*), the great semi-mythical Spartan legislator. The account of him in the largely legendary form in which it has come down to us is that he was the brother of a king of Sparta. His brother died, and the widowed queen, who loved Lycurgus, proposed to him to share the throne with her, and to murder the child

which would shortly be born. To prevent this crime, and preserve the safety of the state, he consented in appearance, but as soon as the child was born seized upon him, proclaimed him king, and assumed the guardianship. As soon as the government was settled he relinquished his office to others, and himself travelled over all the known earth, Crete, Asiatic Greece, Egypt, and perhaps India. He is said to have met Homer in Asia Minor. Returning to Sparta with ample knowledge of all forms of laws, he was unanimously invited to give his native city the benefit of his wisdom. He consulted the oracle of Apollo at Delphi, and was encouraged in his task. He remodelled the whole Spartan state, received the cordial approval of the oracle upon his work, and then called the Spartans together, and took an oath from each one that he would alter nothing until his return. This being solemnly sworn to, Lyeurgus left Sparta a second time, as if to seek further knowledge; but he never returned. Thus the laws of Sparta, as he meant they should be, were for ever unchangeable. He was believed to have been taken up among the gods, and a temple was built to him in Sparta. The usual date given to Lyeurgus is some indefinite period *before* B.C. 825. For the legislation of Lyeurgus see SPARTA.

**LYDIA**, an ancient country of Asia Minor, whose boundaries varied at different times. Under the Roman Empire it was bounded on the S. by Caria, from which it was separated by the river Meander; on the N. by a range of mountains named Sardene, which divided it from Mysia; on the E. by Phrygia; and on the W. by the *Ægean*, though the tract of country along the coast was more commonly called Ionia. Lydia was intersected by mountain ranges, running from east to west, of which the principal, called Mésogis by Strabo, forms the northern boundary of the valley of the Meander. Another chain of mountains, named Tmolus, runs parallel to the Mésogis, and terminates on the west coast opposite the Island of Chios. A branch of Tmolus, called Sipylus, stretches more to the north-west, towards the towns of Cuna and Phocæa. Lydia is thus divided into two principal valleys: the southern, between Mésogis and Tmolus, through which the Caystrus flows, is of moderate extent; but the northern, between Tmolus and Sardene, watered by the Hermus and its tributaries the Hyllus, Pactólus, and Coganus, forms a considerable plain. The fertility of Lydia and the salubrity of the climate are frequently mentioned by ancient writers. Chishull speaks of the country between Tmolus and Mésogis as a "region inexpressibly delicious."

According to Herodotus, the Lydians were of a common origin with the Carians and Mysians (i. 171).

The early history of Lydia is told by Herodotus (i. 6, &c.), who says that three dynasties ruled in Lydia—the Attyadæ, the Heraclidæ, and the Mermuadæ, from B.C. 716 to 566. The proper history of Lydia begins with the last of these dynasties. The first king of this dynasty was Gyges, and the last was Cræsus. The Lydian kingdom had its greatest extent during the reign of Cræsus, who subdued all the people of Asia Minor west of the river Halys (Kizil-Ermak), with the exception of the Cilicians and Lyeians (Herodot. i. 28). But this empire was overthrown by Cyrus (B.C. 566), and the country became a Persian province. After Alexander's conquests Lydia, with the rest of Western Asia, formed part of the empire of the Seleucidæ; and on the conquest of Antiochus by the Romans (B.C. 189), it was given to Eumenes, king of Pergamus. On the death of Attalus III. (B.C. 133) it came, with the other dominions of the kings of Pergamus, into the power of the Romans.

The Lydians carried on a large trade, and had abundance of the precious metals. They are said by the Greeks to have been the first people who put a stamp upon gold and silver, and were notorious for the immorality of some of their customs.

The most extraordinary work of art in ancient Lydia was the enormous sepulchral mound of Alyattes, the father of Cræsus. It was 1300 feet in width.

The Grecian towns on the coast of Lydia belong to Ionia. The most important of those towns which properly belonged to Lydia were Sardis, called at present Sait, Philadelphia, called at present Allah Shehr, and Thyatira, the modern Arkhissar.

**LYD'IAN** (from *Lydia*, a country of Asia Minor), an epithet applied by the Greeks to music which was of a tender and flowing character,

"Softly sweet, in Lydian measure,  
Soon he soothed the soul to pleasure."  
—*Druiden*.

The character of this poetry is said to have been striking and animated, yet capable of pathos and melting softness; and it was on this account that Plato banished it from the republic. Some attribute its invention to Amphion, but Pindar states that it was first used at the marriage of Niobe. As a term of Greek music the Lydian mode means the scale of F $\sharp$  (our F $\sharp$  minor with E, and not E $\sharp$ , as the seventh of the scale). Hypo-Lydian was the similar Greek scale from C $\sharp$ , and Hyper-Lydian that from B.

**LYD'IAN STONE**, a silicious rock or impure crypto-crystalline quartz, containing an admixture of alumina, carbon, and oxide of iron; it has probably been produced from argillaceous sandstone or from sandy shale, by a process of baking or metamorphism. It is a hard stone and of a velvet black colour, so that it is used for trying the purity of the precious metals; hence it is often called touchstone. This operation is performed by placing the streak of some test pieces of known fineness alongside of the streak of the alloy under examination; by treating the streaks with nitric acid and noting its action, a close approximation to the fineness of the alloy may be arrived at.

**LY'ELL, SIR CHARLES**, one of the most distinguished geologists of the nineteenth century, was born at his father's seat near Kirriemuir, in Forfarshire, on 14th November, 1797. He received his early education at a private school at Midhurst, and completed it at Exeter College, Oxford, where he took his bachelor's degree in 1819, obtaining a second-class in classical honours. On leaving the university he studied for a time for the bar, but did not follow that profession long, his tastes having been led by Dr. Buckland's lectures to study geology as a science, and in 1824 he was appointed one of the secretaries of the Geological Society of London—a society of which he was one of the earliest members. After writing various articles on geological subjects, showing a great power of observation and generalization, he issued his *magnum opus*, "The Principles of Geology," in three successive installments, published respectively in 1830, 1832, and 1833. The work, afterwards enlarged to four volumes, has passed through several editions, and is still in demand among students of the science. It was subsequently divided into two parts, which were published as distinct books—viz. "The Principles of Geology, or the Modern Changes of the Earth and its Inhabitants, as illustrative of Geology;" and secondly, "The Elements of Geology, or the Ancient Changes of the Earth and its Inhabitants, as illustrated by its Geological Monuments." The chief feature of the "Principles of Geology" was the success of the first attempt which had ever been made to explain the former changes of the earth's surface by the long-continued operation, through indefinite periods, of causes now in action, even to the accounting for former variations of climate by corresponding variations in the relative distribution of land and sea. This powerful advocacy of the just principle of examining the present in order to restore the past, laid the basis of the present high position and popularity of geology. The voluminous amount of facts that had been patiently and laboriously collected was rendered attractive by Lyell's clear argumentative

logic, by his aptness in illustration, which, combined with a peculiarly flowing narrative-style of language, caused this elaborate treatise to be read by thousands with the same avidity as a novel. In 1860 Sir Charles Lyell published another very important work on "The Antiquity of Man," summarizing and discussing all the important facts which had accumulated up to that time in favour of the high antiquity of the human race, viewed from the standpoints of the archaeologist, the geologist, and the philologist. In recognition of his valued labours in the cause of geological science, he was knighted in 1848 and created a baronet in 1864. But far above these honours he rated those recognitions which he received from his fellow-workers in the field of science. Thus he received in 1858 the Copley medal of the Royal Society, and in 1866 the Wollaston medal of the Geological Society. He was twice president of the Geological Society of London, first in 1836 and again in 1850. He also presided over the British Association at the Bath meeting in 1864. Although his advanced views rendered him for some years unpopular at his university he quite outlived it, and the honorary degree of D.C.L. was conferred upon him in 1855. He died in London on the 22nd of February, 1875, aged seventy-seven, and was buried in Westminster Abbey. See "Life and Letters of Sir Charles Lyell," edited by Mrs. Lyell (1881).

**LYLY, LILY, or LILLY, JOHN**, the author of the famous "Euphues" (1580), which gave a new word to the English language [see EUPHUISM], and of some dramas and essays, was born in Kent, 1564, went to Oxford, and graduated M.A. 1575. In his play of "Campaspe" (1584) occur some famous lines which by themselves would suffice to make him memorable:—

"Cupid and my Campaspe played  
At cards for kisses; Cupid paid," &c.

He was protected by Lord Burghley, but never obtained much court favour, though it was not for want of continued and persistent begging. He asked for the mastership of the revels at every vacancy, but never obtained it. When confiscations were going on, in 1593, Lyly wrote to Queen Elizabeth begging for "some laude, some good fines or forfeitures that should fall by the just fall of these most false traitors, that seeing nothing will come by the Revels I may pray upon the Rebels. Thirteen years your Highness' servant, but yet nothing; twenty friends that though they say they will be sure, I find them sure to be slow," &c. This is a fair specimen of the euphuistic style, full of word plays and conceits. Lyly died 1606. He enjoyed great reputation in his day, and was not underserving of it.

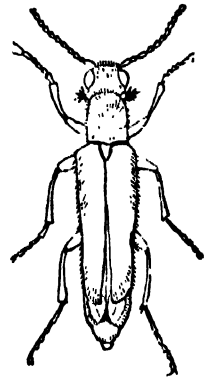
**LYME REGIS** (the "king's haven"), a small seaport town of England, in the county of Dorset, 20 miles W. from Dorchester, and 149½ W.S.W. from London, being 6 miles distant from the Axminster station of the London and South-western Railway. The streets are narrow and irregular, but clean and well paved, and the houses generally substantially built of stone. Some, in the lower part of the town, are often inundated at high tides. The town is frequented in summer as a watering-place, and many respectable families reside in the neighbourhood—the climate being considered very favourable to persons in delicate health. The church is a handsome old structure, and there are Roman Catholic and other chapels. The pier, called the Cobb, was originally built in the reign of Edward III., and greatly lengthened in 1826 at the expense of the government. It retains the traditional parapeted character common to the ancient harbour-works of the older seaports of the west. The trade of the port, however, is small. Lyme Regis formerly had a large trade in connection with the Newfoundland fishery, and also with the Mediterranean, and in the time of Edward III. it was a place of very great importance. To the siege of Calais it sent four ships and sixty-two men, and was paid home in

return by invasion, being twice plundered and burned by the French. In 1558 the great engagement with the Armada took place off Lyme Regis, and in 1672 the Dutch fleet was defeated here by the English. The most remarkable and glorious feature in the history of Lyme Regis is its famous defence in 1644 against Prince Rupert, when it was one of the keys of the Roundhead cause in the west of England, and when its capture would have led up to great disaster. In this defence it was that Blake first proved his ability. It was at Lyme Regis that the Duke of Monmouth landed on the 11th June, 1685, and met with a most hearty reception from the townsfolk. As a result the town smarted heavily under the lash of Jeffreys, and thirteen of its inhabitants were executed. The population of Lyme Regis in 1881 was 2290.

The lias in the neighbourhood abounds in fossil remains of gigantic reptiles, which were first discovered by Miss Anning, a native of the town. Lyme Regis is a municipal borough governed by four aldermen and twelve councillors. It was formerly a parliamentary borough, but was disfranchised in 1868.

**LYME-GRASS** (Elymus), a genus of grasses belonging to the tribe Hordeacea. One species only is a native of the British Isles. *Elymus arenarius* is a coarse grass, common on sandy sea-shores; and, with other grasses, it sends down long fibrous roots among the sand in such a way as to prevent its moving about with the winds. For this reason it has been sown on the sea-shore, but in Holland *Elymus giganteus* is preferred.

**LYMEXYLON** is a genus of Beetles belonging to the group MALACODERMI, of great interest on account of the destruction to oak trees and ship timber which the European species has caused by its boring habits. Kirby and Spence quote the *Lymexylon navale*, a British insect, as a striking exemplification of the utility of entomological knowledge. In the royal dockyards of Sweden great quantities of oak-timber were destroyed by the ravages of an insect. The king desired Linnaeus to investigate the matter, which the great naturalist did; and finding it was this beetle which caused the destruction, he suggested that the oak-timber should be immersed in water during the time of the metamorphosis of the beetle and its time for depositing its eggs. This suggestion was adopted, and it proved a remedy which effectually secured the timber from its future attacks. The body in this genus is long and narrow, with slender legs; the head is bent down and narrowed behind; the eyes are very large; the maxillary palpi are stout and composed of four joints.



*Lymexylon navale*.

**LYMINGTON**, a town of England, in the county of Hants, 97½ miles from London by the London and South-western Railway, situated on the right bank of the Boldre, near its mouth in the Solent, 12 miles south-west of Southampton, in the New Forest, of which it is regarded as a kind of capital. It is here that the Forest courts are held. Lymington is a well-built, brisk little town, picturesquely situated on a rather steep declivity running down to the water's edge. Beyond yacht-building it has no particular trade, but it is the centre of an extensive country district, with many good residences in the neighbourhood. In old times it was a great place for making salt, a large number of salterns having once existed here; but there is nothing of the kind now, the Worcester and

Cheeshire rock-salt having destroyed this branch of manufacture everywhere. Its port, too, was of great note, for in Edward III.'s reign it contributed more than twice as many ships for the invasion of France as Portsmouth. Lynton returned two members to the House of Commons until 1868, and one from 1868 until 1885. The population in 1881 was 4866. It has many houses for the accommodation of sea-bathers, a very handsome parish church, a town-hall, baths, and custom-house, and a celebrated yacht-building yard. The harbour admits vessels of 600 tons. Steamers ply to Portsmouth and the Isle of Wight.

**LYMPHATIC SYSTEM.** The lymphatics are the system of vessels which, from the part that they take in the process of absorption, are not unfrequently called absorbents. They consist of minute branched tubes of extremely delicate membranes, like very small and thin-walled veins, and most of them, like veins, are provided with folds called valves, to prevent a backward flow. Their extremities are arranged in a more or less dense network in every part of the body, except in the hair, nails, outer skin, and a few other non-vascular parts. From this network they gradually converge into a succession of branches of increasing size, and terminate in the thoracic duct, which empties itself into the left subclavian vein. There is a much smaller duct on the right side, emptying into the right subclavian vein. The flow of the lymph is always in one direction, and is due to the pressure of the muscles of the body upon the lymphatics as they swell when called into action, and also the *vis a tergo*, the pressure of the lymph itself from behind as it is continually absorbed (compare the flow of sap in a tree). The great bulk of it passes upwards the whole length of the spine along the thoracic duct. This is chiefly provided by those absorbents of the lymphatic system which surround the alimentary canal, and which are called *lacteals*, because the fluid they extract from the food during digestion is milky in appearance (Lat. *lac*, *lactis*, milk); and this milky lymph is called *chyle*. But there is no essential distinction between lacteals and lymphatics in general. All lymphatic vessels pass at some part of their course through one or more of the bodies known as lymphatic glands. These are glandular structures containing an envelope of nodules of gland substance with a central or medullary part of rounded cords, forming a close fine meshwork. All this is supported by a kind of fine net or scaffolding of interwoven *trabeculae*, processes thrown out from the inside of the capsule of connective tissue which forms the coat of the gland. The lymph is poured into the nodular envelope by the afferent lymphatics, permeates the gland, and is collected and taken away by the efferent lymphatics, which rise in the central medullary portion.

Chyle is elsewhere described [see CHYLE], and lymph is just the same, only that it has less fatty and proteid matter and is clear. And the composition of both lymph and chyle is in all main respects that of the blood, whose waste it is their function to correct. Lymph is undoubtedly chiefly the *liquor sanguinis*, which is perpetually exuding from the blood capillaries into the tissues they nourish, and which is thus collected by the lymphatics and restored to the blood.

**LYNCH LAW**, the name given, in the United States of America, to a rough, summary method of administering justice or exacting retribution without the use of the ordinary forms of the law, which is sometimes adopted by communities, societies, or even by riotous and disorderly mobs. The origin of the term is uncertain, though most authorities derive it from the name of a Virginian farmer of the seventeenth century, who was accustomed to punish thieves by flogging without calling for the aid of the law, and who, at the request of his neighbours, was accustomed to act as judge, though without recognized legal authority. Others

trace the use of the term back to the fifteenth century, and find its origin in the act of James Fitzstephen Lynch, a magistrate of Galway, Ireland, who is said to have hanged his own son without the formality of a legal trial for the crimes of murder and robbery; while a third theory would derive it from the Anglo-Saxon word *linch*, which meant to beat with a stick or club. In the well-settled states lynch law is almost unknown, except in times of great popular excitement; but in the frontier towns and mining camps it is still a recognized and useful institution. In the early history of the western states lynch law was administered by regularly formed societies, known as vigilance committees, or regulators, and as the authority of these bodies was supported by all the reputable members of the community, they were able to promptly break up and disperse any criminal organization, and to keep the most reckless desperadoes in awe. In dealing with minor offences the punishments administered generally consisted of the giving of a few hours' notice to quit the town or camp for ever, flogging, or tarring and feathering; but burglary, highway robbery, horse stealing, and murder were always punished with death.

**LYNDHURST**, a village in the centre of the New Forest, Hampshire, 8 miles W.S.W. of Southampton, and 87 miles from London, being 3 miles from the Lyndhurst Road station of the South-western line. It has only 1589 inhabitants, but contains the King's House, or official residence of the lord warden of the forest. It possesses a pretty Second Pointed church, with a tower and octagonal spire 130 feet high. In the vicinity is the spot where William Rufus is supposed to have been slain by Tyrril's arrow.

**LYNDSAY, SIR DAVID.** See LINDSAY, SIR DAVID.  
**LYNN**, distinguished as Lynn Regis, or King's Lynn, a parliamentary and municipal borough, port, and market-town of England, in the county of Norfolk, is situated on the right bank of the Ouse, a little above its outfall. It is 40 miles W. by N. from Norwich, 27 N. by E. from Ely, and 99 miles from London by the Great Eastern Railway. Lynn is supposed to have existed before the Conquest, and to be on the site of an old Roman town. At present it extends in length a mile on the east bank of the river, and is about half a mile in breadth. It is traversed or bounded by several narrow streams, which are spanned by many bridges. There are yet remaining a few fragments of the old walls, and also one of the original gates. The principal streets are parallel with the river. Smaller streets connect them, or branch out from them. The town has been much improved; good streets have been laid out; several old ones widened and improved, and many handsome houses erected. The town is abundantly supplied with excellent water. The guildhall, an ancient building of stone and flint, contains court-rooms, assembly-rooms, and the monuments of the corporation. Among the latter is the celebrated Red Book of Lynn, said to be the oldest paper book in existence, which serves as a sort of chartulary for the corporation. There are also an exchange and custom-house, an excise office, a theatre, market-house and corn-exchange, atheneum, pilot office, and the West Norfolk and Lynn Hospital. The Tuesday market-place is one of the largest and oldest market-places in the kingdom, having been known by that name, Forum Martis, in the reign of Richard I. The Church of St. Margaret's is a cruciform building of spacious dimensions, containing portions of the Early, Decorated, and Perpendicular styles of English architecture. It was thoroughly restored in 1875, and a lantern tower of great height erected. The Chapel of St. Nicholas is a large edifice, chiefly of Decorated or Perpendicular English architecture. All Saints Church is also a cross church, but of smaller dimensions than St. Margaret's. The Chapel of our Lady on the Mount, or Red Mount Chapel, on the east side of the town, is remark-

able for its beauty. All of these have been restored within modern times. The town contains some cocoa-nut matting and flax mills, corn and seed-crushing mills, agricultural implement and machine works, iron and brass foundries, a shipbuilding yard, malt-houses, and breweries. The commerce of the port is considerable, in consequence of the convenient harbour, which has been much improved by cutting a new channel. In 1869 the Prince and Princess of Wales opened a dock with a water surface of 7 acres. The exports are principally corn and agricultural produce, sent coastwise, and a fine white sand ground near the town, and used for making glass. A vast quantity of shrimps caught on the shores of the Wash are sent to London. The imports are corn, coal, oilseed cake, and cork timber from America; timber, deals, hemp, and tallow from the Baltic; wine from France, Spain, Portugal, &c. In 1887 there were 90 vessels (8000 tons) registered as belonging to the port. The entries and clearances each average about 1100 (175,000 tons) per annum. The municipal borough is divided into three wards, and is governed by six aldermen and eighteen councillors. The parliamentary borough had a population of 18,475 in 1881. It formerly returned two members to the House of Commons, but was deprived of one by the Redistribution of Seats Act of 1885. The Norfolk Estuary Improvement Company have recovered 4000 acres of land from the neighbourhood of King's Lynn since 1850, and the work is still in progress.

King's Lynn (called Bishop's Lynn before Henry VIII. conferred on it its present name) received its first charter from King John, in return for valuable services done him by its inhabitants during the baronial wars. Its corporate privileges were confirmed and enlarged by several monarchs, and lastly by Charles II. The episode in history most closely connected with the town is the visit of King John shortly before he and his army were overwhelmed by the incoming tide in the Wash hard by. He is then said to have given the town a cup, weighing 73 ounces, and a sword, which are still exhibited to the credulous, but which are really of later date—the former being conjectured to be not older than Edward III., and the latter than Henry VIII. Lynn was the only Norfolk town which declared for the king against the commonwealth, and stood a siege in 1643, but eventually had to capitulate after a partial cannonading from West Lynn.

**LYNTON GROUP** of beds is an alternative name for the lowest subdivision of the Devonian rocks as developed in South-west Britain. They consist of slates and schists with green and purple sandstones and thin limestones. They form in the aggregate a series of beds of considerable thickness, but the base is not seen. They are not rich in fossil remains, the most plentiful forms being brachiopods and corals; these, however, are not of Silurian species, with the exception of the brachiopod *Atrypa reticularis*. No remains of either cephalopods or gastropods have been found. Several species of trilobites occur, also some fragments of fish remains. The beds are seen about Looe, Cornwall, and near Lynton and Lynmouth.

**LYNX** is the name of a group of animals belonging to the cat tribe (FELINÆ). The lynxes are intermediate in size between the lions, tigers, and leopards and the smaller wild cats. The ears are long and pointed, with a tuft of long stiff hair at the tips, and the fur on the cheeks is very long. The lynxes are at once distinguished from the true cats by the length of their limbs and the shortness of their tail, which is truncated at the tip. The pads of the feet are more or less overgrown with hair. The skull does not differ in any essential character from that of the other members of the genus *Felis*, but that the small anterior upper premolar tooth is usually wanting, thus reducing the total number of teeth to twenty-eight. Some authorities constitute a distinct genus *Lynx* for these ani-

mals, while others prefer to regard them as a section of the great genus *Felis*. The lynx was sacred to Bacchus, but it is uncertain to what animal the title was applied. Many fables were told of this animal; its sight was said to be so piercing as to penetrate opaque objects, whence we get our epithet "lynx-eyed."

The Common Lynx (*Felis lynx*) is an inhabitant of Scandinavia, Russia, and Northern Asia. It is now almost extinct in Central Europe, in the forests of which it was once tolerably abundant: it is still found, extremely rarely, in the Alps. The lynx inhabits forests in mountain regions. They live on mammals and birds, and when more abundant destroyed numbers of sheep and lambs. They are courageous and bloodthirsty, and capture their prey by stratagem, either lying in wait or stealing noiselessly upon it, and making a sudden spring. The common lynx is about 40 inches in length from the snout to the root of the tail, the latter measuring some 6 or 8 inches; it stands 25 inches high at the shoulders. The colour is variable, but usually dark reddish-gray, spotted with reddish-brown. Its flesh is eaten in Siberia and also in Switzerland. The skin is valuable. The Siberian Lynx (*Felis cerveria*) is by some considered a distinct species; it is a little smaller than the common lynx. The Pardine Lynx (*Felis pardina*) takes the place of the common lynx in the south of Europe, being found in Turkey, Greece, Sicily, Sardinia, and Spain. It is smaller, with its fur reddish, spotted with black. The Canadian Lynx (*Felis canadensis*) is abundant in Canada and the Rocky Mountain district. It is about the same size as the common lynx. The fur is thick, gray above with darker clouds, and lighter beneath. The Bay Lynx or American Wild Cat (*Felis rufa*) is smaller and is described as a cowardly animal. Its fur is reddish-brown. It is widely distributed throughout the United States, from the Atlantic to the Pacific, the species described from Texas, Mexico, and the Pacific coast (*Felis maculata* and *Felis fuscata*) being probably only varieties. It is not improbable that all the so-called species of the lynx will be found to be local varieties of one fundamental form. The CARACAL (*Felis caracal*) is often called the Persian lynx, and is nearly allied to this group.

**LYONNAIS**, a former province of France, which now forms the departments of RHÔNE and LOIRE. Lyons was its capital.

**LYONS** (the ancient *Lugdunum*, and in French *Lyons*), the capital of the department of Rhône, in France, is situated at the confluence of the Rhône and the Saône, 288 miles S.E. of Paris, and had 378,232 inhabitants in 1886. *Lugdunum* is said to have been founded by L. Munatius Plancus, who settled a portion of the inhabitants of Vienna (the French Vienne), when driven from their homes by a revolt of the Allobroges, about 42 B.C. Strabo describes it as the most populous city of Gaul, except Narbonne (iv. 192, Casaub.) It was the great mart of the Romans, who had a mint here for coining gold and silver; and it gave name to one of the four great divisions of Gaul. The city was utterly destroyed in a single night by fire, about 59 A.D., and was rebuilt chiefly by a grant from the Emperor Nero, to whom the citizens manifested their affection and fidelity on his downfall. In the beginning of the fifth century the Burgundians possessed themselves of the town and of the south-eastern part of Gaul. On their overthrow it came into the power of the Franks. During the Roman period, it occupies a considerable place in ecclesiastical as well as in civil history. The gospel had been early introduced into this part of Gaul, and a severe persecution raged in the reign of Marcus Aurelius Antoninus, in 172 or 177, and the churches at Vienna (Vienne) and *Lugdunum* sent a relation of their sufferings to those of Asia and Phrygia. Pothinus, bishop of Lyons, was one of the martyrs. His successor was Irenæus, one of the most eminent of the early fathers.



In the division of the Frankish kingdom under the Merovingian princes, Lyons, as we may now call it, was included in the kingdom of Burgundy (561-613). In the division of the Frankish empire among the grandchildren of Charlemagne in 843, the city with the district of Lyonnais, fell to the lot of the Emperor Lothair; and in the subsequent division of his states in 855 to Charles, king of Provence, who made it his usual residence. On his death in 863 it was seized by Charles the Bald, king of France. On the re-establishment of the kingdom of Burgundy by Boson in 879, Lyons was included in his dominions. In the troubled period of the later Carolingian kings, the town was subject alternately to them and to the kingdom of Transjuran Burgundy. It was in these times that the counts or governors of Lyons succeeded in establishing a hereditary sway over the districts of Lyonnais, Forez, and Beaujolais, but not over the city of Lyons, the lordship of which was obtained by Bouchard, archbishop of Lyons, and after his time remained annexed to the see. The archbishops, whose temporal power over the city was confirmed by the emperor in 1157, received the title of exarch; they were allowed free and independent jurisdiction, except in so far as they were subject to the supreme authority of the emperor and the general laws of the empire.

About the middle of the thirteenth century, the citizens became dissatisfied with the government of their ecclesiastical rulers; they elected a municipal body, between whom and the archbishop dissensions broke out, which led to the annexation of the city by Louis IX., the judicial administration remaining partly in the hands of the archbishop and partly in the municipality or consulate, as the civic council of Lyons was called. The citizens had the right to elect their own magistrates, and to control the receipts and outlay of the municipal officers; they were also exempted from the jurisdiction of any courts but those established in the city. Under this government the town increased in population, wealth, and commerce, till the sixteenth century, when it suffered much at the hands of the Huguenots, but recovered its prosperity in the seventeenth and eighteenth centuries. In the year 1793, during the government of the Convention, the citizens rose against the tyranny of the revolutionary club which had been established in the city, and seizing the town-hall put Challier, president of the club, to death. To avenge this affront, the Convention sent an army of 60,000 men with 100 pieces of cannon. The town was bombarded, and obliged, after a siege of sixty-six days, to yield to famine and force; and during the cruelties that followed in the next five months nearly 6000 victims perished, including those who fell in the defence; the principal buildings were demolished, and a new name—*Commune Affranchie*—was given to the city. This dreadful blow, together with the long war which followed the French Revolution, caused the commerce and manufactures of Lyons to languish. On the return of Napoleon from Elba, in 1815, his cause was espoused by the Lyonnese. In 1831 and 1834 Lyons was the scene of great disturbances, which originated in the disputes of the trades unions with the master manufacturers respecting wages, but were increased by the republican party, who made use of them for their own purposes. In the last-mentioned year, the insurgents, by barricading the suburbs, contested the possession of the town for two days with the military. Numerous famous historical personages have been natives of this city; among them Claudius, Caracalla, and Marcus Aurelius, Roman emperors; and St. Ambrose, St. Irenæus, and Pope Clement VI.

The city of Lyons is very advantageously situated on the railway from Paris to Marseilles, and on the navigable rivers the Rhône and the Saône, in the fork between which the greater part of the town is built. This part of Lyons formerly consisted of narrow, crooked, dirty streets, formed by solid-built houses of seven or eight storeys high, but

many alterations and improvements have been made in the widening of streets and the erection of handsome buildings. To afford room for the extension of the town southwards, the two rivers have been made to meet about a mile below their original junction, thus forming the peninsula of Perrache, on which the streets are built with much regularity and elegance, and some beautiful promenades are laid out. In March, 1848, the old fortifications were ordered to be demolished, and a wider *enceinte* constructed, so as to include the suburb of Croix Rousse. A considerable part of the town lies on the right bank of the Saône, both shores of which are lined with quays. Here also is the steep hill and suburb of Fourvières on the south-west, and the suburbs of Serin and Vaize on the west. On the left bank of the Rhône are the suburbs of Brotteaux and Guillotière, and the beautiful park and gardens of Fête d'Or; its right bank is lined with quays throughout the whole length of the city, some of them being planted with trees, and forming delightful promenades.

The suburbs of Fourvières and Croix Rousse are chiefly inhabited by silk weavers. The hill of Fourvières is said to derive its name from *Forum-Vetus*, an ancient Roman structure which stood on its summit, and on the site of which the church of Notre Dame is now built. The remains of an aqueduct and amphitheatre have been found on this hill. From the terrace close by this church, or from a tower erected near it, the view over the city of Lyons, with its two noble rivers, its squares, chief structures, quays, avenues, and bridges, the hills and plains in the vicinity, and the snowy peak of Mont Blanc and the Alps of Dauphiné in the far distance, presents one of the most varied and most beautiful panoramas in Europe.

The Rhône, which runs along the eastern side of the town, flows with a rapid current and a width of 656 feet, and is spanned by nine bridges, that unite the city to the populous suburbs of Guillotière and Brotteaux, which are protected from the inundations of the river by high embankments. The Saône flows in a gentle current, with a breadth of 492 feet, along the base of the hill Fourvières, a projecting crag of which formerly blocked up the passage along the right bank, but was cut through by the Romans, and hence it got the name of *Petra Exscissa*, still remaining in the modern name *Pierre-Scise*. It is crossed by thirteen bridges.

Of the numerous squares or open spaces in the city, the finest are—the Place Bellecour, which is planted with lime-trees, and is one of the largest squares in Europe; and the Place des Terreaux, of which the town-hall and the Palais des Arts form two sides.

The public structures of Lyons are numerous, and with some exceptions more remarkable for solidity than elegance. These the space allowed for this article will permit merely to mention. Among the chief religious edifices are—the splendid cathedral of St. Jean, on the right bank of the Saône, the churches of St. Pierre, d'Ainai, de l'Observance, Notre Dame de Fourvières before mentioned, St. Nizier, St. Bonaventure, St. Polycarpe, des Chartreux, St. Georges, St. Irénée, and St. Just. These, together with the palace of the archbishop, form a series of buildings interesting from their architecture, extent, decorations, and antiquity. Among the civic structures are the prefect's residence, once a Jacobin convent, recently reconstructed at a cost of £60,000; the town-hall, the finest building of the kind in France; the court-house; the public library; the Palais des Arts, in which are galleries of paintings and sculptures, cabinets of medals, collections of minerals and of natural history, specimens of silk manufactures, &c.; the hall of commerce, built at an expense of £120,000; exchange; the college; the veterinary school; the mint; the general hospital, or Hotel Dieu; the Maison de la Charité, or asylum for the poor; the Hospital de l'Antiquaille, built on the site of the Roman palace in which Claudius, Caligula, and Germanicus



were born; the Mont de Piété; the prisons; the two theatres; and the numerous barracks.

The fortifications of Lyons were enlarged and strengthened under the imperial régime, and consist of a girdle of eighteen forts. Its environs are now dotted with numerous country seats, gardens, and vineyards.

Lyons is an important manufacturing town. The staple articles of industrial produce are silk stuffs of all descriptions, which are famous for solidity of texture, richness and permanence of dye, and beauty of design. In this manufacture about 250,000 of the population are directly or indirectly concerned. Cashmere and silk shawls, ribbons, cotton cloth, hosiery, hats, printed calico, jewelry, liqueurs, chemical products, gold and silver lace, crapes, tulie, glue, sheet lead, musical strings, ornamental paper, &c., are also made. There are, besides, numerous printing establishments, dye-houses, metal foundries, glass-works, potteries, tan-yards, breweries, boat-building yards, &c.

Lyons is also, from its advantageous position, a place of great commerce. The products imported into the town for its own consumption, or for re-exportation, are wine, brandy, oil, hemp, flax, soap, rice, chestnuts, salt, raw cotton, coffee, indigo, sulphur, lead, teasels, madder and other dye-stuffs, &c. Timber, firewood, building stone, and asphalt are the chief articles brought down the Rhône to this city. Down the Saône are brought timber of all kinds, oak staves, firewood, charcoal, tanning bark, iron and iron ore, gypsum, hay, straw, corn, building stone, bricks, tiles, &c. Steamers ply on the Saône to Châlon-sur-Saône, and on the Rhône to Avignon and Arles. The town has communication with the Rhine by the Canal du Rhône-au-Rhin, and with Paris by the Saône and the canals that join it to the Seine. A railway, 35 miles in length, unites Lyons to the great manufacturing town of St. Etienne and the extensive coal-fields of the department of Loire.

Lyons gives title to an archbishop, whose see includes the departments of Rhône and Loire. It is the seat of a high court and of a university academy. Connected with the university there are in Lyons faculties of theology and the sciences, a secondary school of medicine, and a college. The city has also a tribunal of first instance, a tribunal and chamber of commerce, a council of prud'hommes, an academy of sciences and arts, a theological college, a school of the fine arts, a mint, an establishment for deaf-mutes, a school of arts and trades, besides various other literary, scientific, and benevolent institutions.

**LYRA** (the Harp), one of the forty-eight constellations of Pompey, representing the lyre of Mercury or of Orpheus. It is surrounded by Cygnus, Aquila, Hercules, and the head of Draco (see Plate CONSTELLATIONS, Northern Hemisphere, midway between the pole and the figure XVIII., along the colure). Its brightest star, Vega ( $\alpha$  Lyrae) is a conspicuous object in the sky from June to November. In August it is overhead from nine o'clock till midnight. Vega is the seventh star in the sky for brightness; it shines with a greenish lustre. The spectroscope shows that it contains hydrogen, magnesium, sodium, and iron. If a line be drawn through the middle of Cassiopeia, the Pole-star, and the middle of Ursa Major, this fine star may be seen nearly in a perpendicular to that line drawn through the Pole-star.

**LYRE** (Gr. *lura*), a musical instrument of the stringed kind, known under various names from the earliest historical period. Some of the Greeks ascribe its invention to Hermes, some to Ilyperion; but it is possible that they may have had it from the Egyptians, and the Egyptians from Asia. Of many instruments figured or described in early writings it is difficult to decide whether they should be termed lyres, lutes, harps, or guitars. The distinction between the true lyre and a guitar (*citharis*) is that the latter has a neck extending from the soundboard behind the strings, while in the lyre, as in the harp, the strings having

once left the sounding-board are free, and can be played from either side. The strings of the lyre passed over a bridge erected on the soundboard, to which their vibrations were thus communicated; and from the bridge they passed freely up to the cross-bar or "yoke." To support the cross-bar two uprights were necessary, and these were called "horns;" the back of the soundboard, from its shape, was called the "tortoise-shell." The most ancient Grecian lyre had only four strings (*e f g a*). That of Terpander had seven (676 B.C.); and these represented a second tetrachord or group of four notes, beginning where the first left off, *a b b' c' d'*. Terpander's lyre ran therefore altogether *e f g a b b' c' d'*. Later on an eight-stringed lyre was used, where by beginning the second tetrachord a note beyond the first the consonance of the octave was obtained; thus, *e f g a, b c' d' e'*; the old seven-stringed lyres were made to serve for the new music by leaving out the note *c'* and tuning the last notes as *d' e'*. For the further development of the lyre see GREEK MUSICAL SYSTEM. The defect in instruments of the lyre kind is that each string can only give one note, stopping (as in the lute or guitar, upon the neck) not being possible with the open strings of the instrument. Therefore from eight strings only eight notes can be obtained as long as the tuning is unaltered. The lyre was probably used merely to support the voice, and was of little more use melodically than a well-tuned drum.

**LYRE-BAT.** See LEAF-BAT.

**LYRE-BIRD** (*Menura superba*) is a remarkable Australian bird, belonging to the order PASSERES, but not having any marked affinity with any other member of



Lyre-bird (*Menura superba*).

that order. The lyre-bird was first discovered in New South Wales in 1798. The adult male is remarkable for its long and beautiful tail, which is carried erect, and presents a singular resemblance to an ancient lyre. It is composed of sixteen long feathers, the two outermost of which are very long and broad, and beautifully curved so as to represent the two sides of the lyre; they have the inner web very broad, and the outer web very narrow. The middle pair of feathers have a narrow inner web and no outer web; they cross one another near the base and diverge, curving round towards the tip like the outer feathers. The rest of the feathers of the tail are furnished only with

long slender barbs, disposed at intervals on the shaft. This beautiful tail is not acquired by the male till the fourth year, and then is only present in its full beauty during the breeding season. The lyre-bird is about  $8\frac{1}{2}$  feet in total length. The head is furnished with a crest of feathers, and the bill is rather long and robust.

The legs and feet are long and strong. The tarsus and toes are covered with shield-like plates; and the claws are long and nearly straight. The general colour of the plumage is brown, with red tints upon the secondary quills, the upper tail-coverts, and the chin and throat; the lower surface is brownish-ash colour. The two outer tail-feathers are grayish-brown on the upper surface, and white beneath, near the base; beyond this they are marked with bands of grayish and reddish-brown, and terminated by a black patch. In size and general aspects it presents no small resemblance to a pheasant, and it is known to the colonists of New South Wales under the name of the wood pheasant. Its habits also, in some respects, are very similar to those of a game-bird; it dwells principally on the ground, where it runs with great facility and scratches after the fashion of the true Gallinæ. So swift is it in its movements among the bushes of New South Wales that Mr. Gould declares it to be the most difficult to procure of all the birds he ever met with. "While among the bushes," says that distinguished ornithologist, "I have been surrounded by these birds, pouring forth their loud and liquid calls, for days together; and it was only by the most determined perseverance and extreme caution that I was enabled to effect this desirable object."

The nest is placed on or near the ground, at the side of a steep rock, or at the foot of a tree. It is composed of sticks, roots, and moss, and covered with a dome-like roof, having the entrance at the side. The single egg is large, of a purplish-gray colour, with purplish-brown blotches. The young bird is hatched about July, and remains in the nest for six weeks. The food of the bird consists of insects, especially in the larval state, and, according to M. Verreaux, the larvæ of a species of cockchafer constitutes its favourite food. The same ornithologist tells us, that when they quit their resting-places in search of food, the males are usually followed by several females, although during the breeding season they live in pairs, and he adds that besides their natural song, they imitate the notes of all other birds so accurately as to deceive not only the ornithologist, but even the birds themselves. The note of this bird is liquid and varied. The flesh is dry and tough, and quite uneatable. The lyre-bird is known to inhabit New South Wales and the southern parts of Queensland. Two other species have been described, *Menura Victoria*, taking its place near Melbourne, and *Menura Alberti*, having a more northerly range. Both species are very similar in character and habits to the common lyre-bird. Prince Albert's Lyre-bird (*Menura Alberti*), however, does not possess the remarkable lyre-shaped tail; and its outer tail-feathers are shorter than the rest.

**LYRIC POETRY** is commonly understood to be that kind of poetry which is composed for musical recitation; but the epithet has been transferred to all kinds of verse partaking in any degree of the same nature as that to which it was first applied. Thus we hear of lyric measures in Horace, where there is no ground to suppose that they were sung, and no special fitness for the purpose of music. Lyric poetry may, then, be now defined as that class of poetry which has reference to and is engaged in delineating the composer's own thoughts and feelings, in distinction from epic poetry, which details external circumstances and events. The former is therefore called *subjective*, and the latter *objective*.

**LYSANDER** (Gr. *Lusandros*), a Spartan (either a slave in youth or of slave origin) who rose to eminence

towards the end of the Peloponnesian War, and was placed in command of the Lacedæmonian troops on the coast of Asia Minor, B.C. 407. Unlike most of his countrymen, he had great flexibility of character, and gained the regard and confidence of his Persian allies. During his year's command he defeated the Athenian fleet, commanded by Antiochos, as lieutenant of Alcibiades, at Notion. In September, 406, he was superseded by Kallikratidas, who was defeated and slain in the memorable battle of Arginusai. The allies petitioned that Lysander might be reappointed; and having resumed the command he gained the decisive victory of Aigospotamos, which terminated the Peloponnesian War. Lysander sailed to Athens, destroyed the fortifications and the famous Long Walls, and set up the oligarchy of the Thirty Tyrants there. He accompanied Agésilas, king of Sparta, during his first campaign in Asia, where his popularity and renown threw his superior into the shade. About B.C. 396 he returned to Sparta, and meditated the overthrow of the Spartan hereditary kingship. But when he consulted the oracles he everywhere met with ambiguous responses. The meaning of these, to the ancient Greeks, was soon shown; for when, in the following year, on occasion of a quarrel with Thebes, he was sent into Phocis to collect contingents from the northern allies, he was taken by surprise, and slain by the Thebans, at Haliartos in Boeotia, and his grandiose plans came to nought. For some time Lysander was the greatest power in Greece, and he was the first to whom altars were built and sacrifices offered during his life.

**LYSIMACHOS** (Gr. *Lusimachos*), King of Thrace, was one of Alexander's generals; and when the vast empire of the great king broke up at his death (323 B.C.), and was shared out into half-independent governments or vicerealties among the leading chiefs, Thrace and the countries as far as the Danube fell to his share. He was a Macedonian by birth, but of mean origin, and made himself distinguished for undaunted courage and activity. He took the title of king in 306 B.C. He joined other Macedonian kings against Antigonus, king of Asia, their former colleague, and took part in the victory of Issus (301), where Antigonus was crushed after many years of warfare. His share of the spoil was the northern part of Asia Minor. During his wars against the barbarians to the north of his own territory, he was once compelled to surrender with his whole army (291), but eventually he rose to great power, and was able in 286 to drive Pyrrhus from the throne of Macedonia, so that he ruled thenceforward over all the European dominions of Alexander, as well as a large part of Asia Minor. He was induced by his second wife, a daughter of his former colleague, Ptolemy, king of Egypt, to put to death his eldest son and his proper heir, Agathoklès, and the widow of this prince fled for succour to Seleukos, king of Syria, another of the Alexandrian kings (281). He took up her cause, and was joined by many of the cities of Lysimachos in Asia. The kings met in the plain of Corus, and Lysimachos fell. He was in his eightieth year.

**LYTHAM**, a pleasantly situated watering-place of England, in the county of Lancaster, on the north bank of the Ribble, 22 $\frac{1}{2}$  miles from London, in a remarkably well-cultivated district. It is frequented for sea-bathing; and a handsome pier, 914 feet long, has been erected for steamboats as a promenade, and by the levelling of the beach a good public walk, 2 miles in length, has been obtained. There is every convenience and accommodation for visitors, numerous places of worship, a market-house, custom-house, and a dock where vessels discharge their cargoes for Preston. The population in 1881 was 4122. In ancient times the name of the place was spelt *Ledin* and *Lethum*.

**LYTHRÆEÆ** is an order of plants belonging to the POLYPTALÆ (series Myrtales). The order derives its name from the genus *LYTHRUM* (Loosestrife), species

of which are native in this country. *Lawsonia inermis* is the celebrated Henna of the East. *Cuphea* contains many species which are cultivated; they are natives of tropical America. *Sonneratia apetala* supplies good, close-grained wood; it is a native of India at the mouth of the Ganges. *Olivia cymosa*, the Hardpear of the Cape, is a shrub growing from 4 to 10 feet high in rocky places; its wood is used for the axles and poles of waggons, as well as for picture-frames, &c. The POMEGRANATE (*Punica Granatum*) is placed by Bentham and Hooker in this order.

The order is closely connected with the myrtles, but the general distinguishing marks are the following:—The calyx-lobes are valvate; the petals are generally corrugate and deciduous; the stamens are definite or numerous, attached round the calyx-tube; the ovary is generally free, with two or several cells, numerous ovules, attached to the axis of the cells, or arising from the base. There is one filiform style with capitate stigma; the seeds are without albumen. The leaves are mostly opposite, entire, without stipules. There are about 250 species.

**LYTHRUM**, a genus of plants belonging to the order LYTHRARIÆ. *Lythrum salicaria* (purple loosestrife) is a native of Europe, about the margins of ponds and rivers, and is very plentiful in the British Isles. The colour of the flowers varies from crimson to purple. The herbage is generally almost smooth, and of a dark green, but in dry situations it becomes hoary and downy, as well as more dwarf in stature. *Lythrum hyssopifolia* is found in damp places in England and Ireland.

**LYTTLETON**, a seaport of New Zealand, in the county of Selwyn, walled in by precipitous hills, nearly in the coast centre of the Middle Island. It was formerly known by the name of Port Cooper, and is also called Port Victoria. It has a large shipping trade, and is 174 miles by sea from Wellington, and 190 from Dunedin north. It is connected with Christchurch, 8 miles east, of which place it is the port, by a railway tunnelled through the hills. The town is fairly built, and well provided with religious edifices, schools, banks, and all the usual institutions of a prosperous trading centre. The entrance to the harbour is about 2 miles wide, and there is every facility for the loading of vessels, as ships of large draught can lie alongside the jetties and wharves, of which there are several, varying from 116 to 1818 feet in length. The harbour has been improved by the erection of a breakwater from Officer's Point, 210 feet long, which affords protection during the south-west gales. The Naval Point breakwater is 1484 feet long; the two breakwaters inclose an area of about 112 acres. The depth of water within the breakwaters varies from 17 to 23 feet at low tide. There is also a graving dock. The population in 1861 was 4127.

**LYTTON, EDWARD GEORGE EARLE LYTTON BULWER-LYTTON, BARON**, author, dramatist, and politician, a younger son of General Bulwer of Heydon Hall, Norfolk, was born in May, 1805. His mother was the heiress of Richard Warburton Lytton of Knebworth, Herts. He graduated B.A. at Cambridge in 1826, having in 1825 gained the chancellor's prize for English verse by his poem of "Sculpture." During his youthful days he published some volumes of poems, among which were "Ismael" (1820); "O'Neill, or the Rebel" (1827); and he printed, though he did not publish, a collection entitled "Weeds and Wild Flowers." His first prose work, an abortive romance entitled "Falkland," was published anonymously in 1827. In the following year he produced "Pelham," which soon became wonderfully

popular. This novel was succeeded by the "Disowned" in 1828; by "Devereux" in 1829; and by "Paul Clifford" in 1830; while two works, entitled "Eugene Aram" and "Godolphin," were completed and published in 1831. The Mr. Bulwer of those years was a very busy as well as a very celebrated man, for in 1831 he was returned to the House of Commons as member for St. Ives, and he sat for Lincoln from 1832 to 1841. In 1833 he succeeded the poet Campbell for a few months as editor of the *New Monthly Magazine*, and the same year published his "England and the English." To a continental journey we owe the "Pilgrims of the Rhine" (1834), the "Last Days of Pompeii" (1834), and "Rienzi" (1835). On the return of Lord Melbourne to power in 1834, he offered Lytton, who had helped him with a pamphlet called "The Crisis," a place in the government, which was declined, but in 1835 Bulwer accepted a baronetcy, which was conferred ostensibly as a recognition of his eminence in literature. In 1836 Sir Edward Bulwer produced a play entitled "The Duchess of La Vallière," which was withdrawn after a run of only thirteen nights; but his novels, "Ernest Maltravers" (1837) and its sequel, "Alice, or the Mysteries" (1838), fully sustained his high reputation as a writer of fiction. He was ambitious, however, to succeed as a dramatist, and undeterred by his previous failure he produced in 1838 and the two following years three plays which have kept the stage ever since—"The Lady of Lyons," "Richelieu," and "Money." By the death of his mother in 1843 he became the possessor of Knebworth and large estates, and altered his surname to Bulwer-Lytton in accordance with her will; but he continued his literary labours with unabated vigour, publishing "Night and Morning" in 1841; "Zanoni" in 1842; "The Last of the Barons" in 1843; "Lucretia, or the Children of the Night," in 1847; and "Harold, the Last of the Saxon Kings," in 1848. In the latter year he published anonymously in *Blackwood's Magazine* a work written in an entirely different style to that of his previous novels, entitled "The Caxtons," and not until it had made a reputation did he acknowledge the authorship. He continued to work with success the new vein he had struck, and followed up "The Caxtons" with "My Novel" in 1853, and "What will He do with it?" in 1858. He returned to Parliament in 1852, and now sat on the Conservative side. He was colonial secretary under Lord Derby from 1858 to 1859, and was raised to the peerage as Baron Lytton in 1866. In 1862 he contributed "A Strange Story," to Charles Dickens' *All the Year Round*, and he afterwards published anonymously two very successful stories, entitled "The Coming Race" and "The Parisians." His last novel, "Kenelm Chillingly," was written almost upon his deathbed, and he was engaged in correcting the proofs only two days before his death, which took place at Torquay, 18th January, 1873. In addition to the works already enumerated, Lytton was the author of brilliant superficial essays on historical subjects, and a host of minor productions, while he made earnest and persistent efforts to take rank as a poet. Ignoring his juvenile productions, he published, as his first serious effort in original verse, "The New Timon," a satire, in 1845; "King Arthur," a romantic epic, in 1849, upon which he declared he would base his best hopes of fame; "St. Stephen's" in 1860; the "Lost Tales of Milletus" in 1866; and a translation of Horace's "Odes" in 1869. In spite of his own opinion of the merits of his works, it is generally admitted that he has failed as a poet, and it is only as novelist that he has any chance of being remembered.

**M** is the nasal sonant letter of the labial series (or in the old-fashioned nomenclature it is one of the "liquids," *l, m, n, r*). It differs from *b*, the mute sonant of the same series, in that the veil of the soft palate is dropped for *m* while it is closed for *b*, and the *m*-current is thus allowed free entry to the nasal cavity, giving a sonorous tone almost akin to a vowel-tone. It is found that all languages with *m* have also *b* and *p*, its mute and surd correlatives. *M* was almost inaudible in Latin as a termination, in which form it is of such very frequent occurrence in that language, that Verrius Flaccus once proposed to use a special character for this silent *m*-ending. The earliest form of the letter *M* in the Roman alphabet was *𐌛* (with five strokes), which is the original form of the Greek *M* as found among the early Greek colonies of Sicily, whence the Romans derived their literary civilization.

1. *M* is interchanged with *n*. Thus *m*, at the end of Latin cases and tenses, is generally represented by an *n* in Greek. Similarly the German dative *ihm* and accusative *ihn* have been confounded in the English *him*, which is at once dative and accusative. The German *boden*, *busen*, *besen*, *juden*, are in English *bottom*, *bosom*, *besom* (broom). *futhum*; and *mon*, *ton*, *son*, are the French equivalents for the Latin *meum*, *tuum*, *suum*.

2. *M* with *b*. Thus in Latin *hiems* coexists with *hibernus*, *fama* with *fabula*, &c. *Marble* comes from Latin *marmor*, &c. *M* has a great affinity for *b*, as *climb*, *lumb*, &c., and often drags it in, as in *limb* (properly *lim*), *number* (from Latin *numerus*), &c.

3. *M* with *p*. Hence the Greek forms *omma*, *tetummai*, &c., for *opma*, *tetupmai*, &c. The Greek *molubdos* is in Latin *plumbum*.

4. *M* with *v*. This is particularly the case in the Welsh language. The Latin *amnis* is believed to be identical with the Welsh *Afon*, pronounced *Avon*. The Latin language has *promulgare*, apparently for *provulgare*. Compare also *himmel*, *heaven*; *numen*, *error*.

5. *M* with *w* probably. This interchange follows easily from the last, and is a natural step towards the next. The German *mit* seems to be identical with our own *with*, and their longer preposition *wider* is to *mit* or *with* precisely as the Latin *contra* to *con*.

6. *M* disappearing. This appears to have been the case even at the beginning of words. Compare the Greek *mechris* with *achris*, the Latin *manus* with the Teutonic *hand*, &c. At the end of words, at least, the loss of an *m* is very common, particularly after *a*. Thus the Greek and Latin verb often has the first person ending in *o* where analogy would lead to *om*: *τυπώ, scribo*. Compare the words *sum*, *inquam*, besides the other tenses *scribam*, *scribam*. In Latin all the adverbs ending in *o* signifying *motion to*, appear to have lost an *m*—viz. *quo*, *eo*, &c. Hence *adeo*, *quoad*, occur in conjunction with a preposition (*ad*) which elsewhere requires an accusative. Again an *m* has been lost in *postea*, *antea*, *postilla*, &c.; compare *postquam*, *antequam*, &c. In English we have lost it from *five* (Gothic *fimf*) and *soft* (Teutonic *samft*, German *samft*); and, as in the last example, it is often weakened to *n*, as *ant* for *emmet*, *count* for *comte*, *noun* for *nom* (Lat. *nomen*), *account* for *accompt*, &c.

As an abbreviation *M*. serves in music for *mezzo*, half; *mano*, hand; *M.M.* Metrical's Metronome, &c.; in commerce for *month*, as *M/d*, *M/s*, month's date, month's sight, or for thousand, as *500/m*, *50,000*; *m/c* is metallic currency. For other examples see ABBREVIATION.

**MAB'USE** or **MAUBEUGE, JOHN**. This eminent early painter, whose proper name was John Gossaert, was born at Maubeuge in Hainault, in 1470, and studied much in Italy. The finest specimen of this painter, perhaps, is the "Adoration of the Magi" at Castle Howard. He died in 1502.

**MAC** or **M'**, the Gaelic word for son. It is often used as a prefix to Scotch and in a less degree for Irish names, but in many cases it has of late years become incorporated with the name itself, as in Mackenzie, Macintosh, and Macaulay. It is probably allied to the Gothic word *magus*, a son, a boy, and its root is generally believed to be the Sanskrit *mah*, to grow.

**MACAD'AM, JOHN LOUDON**, the inventor of the method of road-making known as the *macadamized*, was born at Ayr, 21st September, 1756. In middle life he was appointed a road trustee in Scotland, and thus was first led to turn his attention to the condition of roads in general, which as then constructed were for the most part very bad, being at once loose, rough, and perishable, and very costly to repair. By many years of careful observation and study he discovered the method since called after his name. It consists in raising the surface of the ground on the track of the fatigued road slightly above the adjoining land, forming drains alongside of it, and scattering over the surface a series of thin layers of hard stone, broken into angular fragments of a nearly cubical shape and as nearly as possible of the same size, no piece being of a greater weight than 6 ounces, and stones of from 1 to 2 ounces being chosen where possible. Each layer of broken stone is gradually consolidated by the traffic passing over it, and when that process is complete the covering of the road becomes a firm solid platform, nearly impervious to water, and durable in proportion to the hardness of the stone of which it is made. Macadam first published an account of his method in 1811, in a paper addressed to Parliament, and he afterwards issued a treatise on road-making, which ran through numerous editions and was translated into several foreign languages. In 1815 he was appointed general surveyor of the roads in the Bristol district, and his success was such that he was afterwards made surveyor of the metropolitan roads, and received a gift of £10,000 from the state. He was also offered the honour of knighthood, but at his own request this was conferred upon one of his sons instead. He died at Moffat, Dumfriesshire, 26th November, 1836.

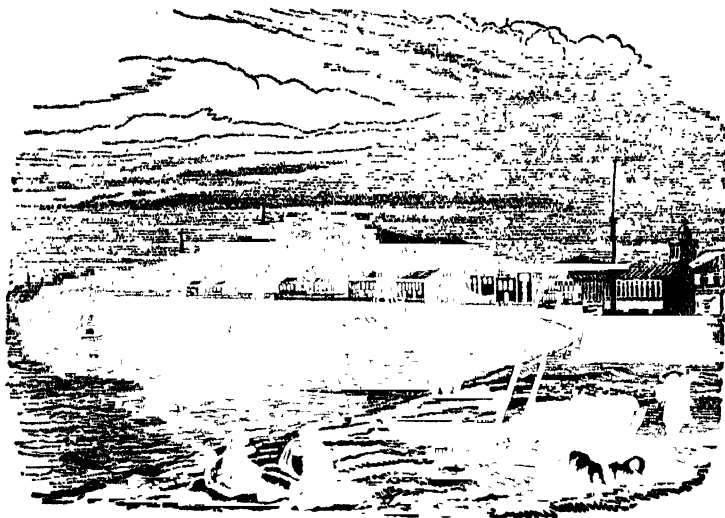
**MACAO**, a Portuguese possession in China, now chiefly noted for its gambling houses, is situated at the southern extremity of the estuary of the Choo Kiang, or Canton River, about 80 miles from Canton by the river. The population is about 75,000, of whom 10,000 are Europeans. The town is built on a peninsula of the island of Heong-shan, which is 2½ miles in length by less than a mile in breadth, and is connected with the island by a narrow, low, and sandy isthmus, forming a landlocked inner harbour, 12 miles in circuit.

Macao itself stands on several declivities, the shore being lined on the outer side by an embanked parade and a terrace of white houses, above which Chinese and European residences are curiously intermingled; but the mass of buildings, chiefly Chinese, are on an inner slope. Both harbours are within the vortex of typhoons, and suffer greatly from them. The climate is, however, very salubrious, and during the monopoly of the East India Company it was a favourite place of resort for Englishmen from India. The principal

edificans are—the collegiate church of St. Joseph, eleven other churches, a convent, hospital, barracks, and the senate house, besides some Chinese temples. Six forts defend the harbour north and west of the town, which is fit only for small vessels. Large ships anchor in a roadstead east of the island. After the rise of Hong-Kong the commerce of Macao almost entirely disappeared, but having been made a free port, its prosperity has returned to some extent. It has some trade in opium, piece goods, woollens, &c., which being imported from Hong-Kong, are conveyed by junks to various ports on the coast—the return cargoes being com-

posed of silk, tin, medicines, gambier, cattle and pigs, betel and cocoa nuts, &c. The port has also a direct trade with Great Britain in tea. The coolie trade was suppressed in 1874. The educational wants of the inhabitants are provided for by the College of St. Joseph, a royal grammar-school, and female orphan asylum. The Portuguese authorities and others form a senate, a governor, and council, but the government of the native population is substantially vested in a Chinese mandarin.

Macao was granted to the Portuguese, subject to an annual rent, by the Chinese emperor in 1586, in return for



Macao.

assistance against pirates. In 1863 the payment of this tribute was rescinded, and the land conceded by treaty to Portugal; but jurisdiction over the Chinese inhabitants was retained. Tradition reports that in a cave in this town Camoens wrote the greater part of the "Lusiad."

**MACAQUE** (*Macacus*) is a genus of monkeys nearly allied to the **GUENON** (*Cercopithecus*). In the *Macacus* the body is stouter than in the *Guenons*, the head larger in proportion, the limbs more muscular, and the tail shorter. The muzzle is heavy; the superciliary ridge is boldly prominent, and the forehead is flattened; the callosities are large, and mostly surrounded by a space of naked skin. There are ample cheek-pouches, and a laryngeal sac is generally present. The last molar of the lower jaw has a fifth tubercle, and the molars are broad. The hind limbs are longer than the fore limbs. The tail is variable; in some species it is of considerable length, and these in general form approximate towards the *Guenons*. In others the tail is short and slender. The *Macacuses* inhabit the forests, living in troops, and are remarkable for boldness and activity. Emboldened by tolerance, they become very audacious, pillaging the gardens and the fields of grain; and their rapacity is seconded by address and cunning.

The Common *Macacus* (*Macacus cynomolgus*) inhabits Java, Sumatra, Borneo, and many of the islands in the Malay Archipelago. It is a large, robust monkey, with short limbs and a long tail. It becomes very savage and brutal when adult. The colour of the upper parts of the body and the outer surfaces of the limbs is greenish-brown, while the lower surface and the inside of the limbs are grayish-white, and the tail blackish. The species is common in menageries. The Bonnet Monkey (*Macacus radiatus*) is another species common in captivity. It is about the

size of a large cat, of a greenish-dun colour on the upper parts and grayish below, and has a long tail. The whole of the face is naked, wrinkled, and of a dingy flesh colour; but the most striking character of the species is to be found in the arrangement of the hair of the crown, which is long and dark-coloured, and instead of standing erect spreads in all directions like rays proceeding from a common centre, lying upon the surface of the head in the same way as the hair of a scalp wig. It is common in some parts of India. Other common *Macacuses* are the **RHESUS MONKEY** (*Macacus rhesus*), the **WANDEROO** (*Macacus silenus*), and the **BARRARY APE** or **Magot** (*Macacus rylvanus*).

**MACARONI**, a food product made of wheat flour in the shape of pipes. The manufacture is carried on chiefly in Italy (it was formerly peculiar to Genoa alone), but also at Marseilles and one or two other places in the south of France. *Vermicelli* is made of the same material, but in smaller rolls. Only the hard sorts of wheat, which contain a large proportion of gluten, are applicable to the manufacture. It is first ground into a coarse meal, and the bran being removed, it is called *Semola*. The flour is then worked up into dough with water, and forced through gauges, as in pipe-drawing, according to the size required. For the *Italian paste* which are now so much used for soups, the dough is simply rolled out into thin sheets and cut into various shapes by means of stamps. *Macaroni* is now much used in England for puddings (if it is made of the best wheat it should swell considerably, and become quite soft, but not break or burst in boiling), and also for making a favourite dish of macaroni and cheese. Both macaroni and *semola* are prepared in the greatest perfection in Naples, where they form the favourite dish of all classes, and the principal food of the bulk of the population.

**MACARONI** was in the last part of the eighteenth century the name for a dandy, and was adopted by some young bloods who had travelled in Italy and had brought home the Italian dish of that name, which they introduced at their fashionable entertainments. The vice, insolence, and frivolity of those Macaronis contriving round the gardens of Vauxhall and Ranelagh serve as bases for the fictions of the period, and certainly have never been surpassed in England. The term is preserved in the original verses of "Yankee Doodle," who

"Stuck a feather in his cap and called him Macaroni."

**MACARONIC VERSE.** As **MACARONI** gets its name from the Italian word *macurre*, to pound up and mix, macaronic is a very appropriate epithet for this kind of verse, invented by the Italian Teofilo Folengo, and first published by him in 1521. It is a mixture of Latin, or dog-Latin, with a native *patois*. It is susceptible of very absurd effects; Molière has given some magnificently ridiculous examples in his "Médecin malgré lui." The best work on this subject is Delepierre's "Littérature Macaronique" (Paris, 1856).

**MACASSAR** or **MANKASSAR**, the chief town of a Dutch settlement of the same name, on the S.W. peninsula of the island of Celebes, is situated at the mouth of the Goä. The port is free, and the harbour affords good anchorage. The chief exports are rice, sandal wood, ebony, opium, tortoise-shell, gold, spice, coffee, sugar, cocoa, nuts, and edible nests. Cotton, firearms, and spirits are imported from Europe. There are valuable trepang fisheries. The climate is healthy. The population is about 20,000. It was colonized by the Portuguese in 1612, became subject to the Dutch in 1710, and was made a free port in 1846. The harbour is defended by Fort Rotterdam, whose ancient and irregular batteries descend to the sea-line. Its trade with China is considerable and direct.

**MACASSAR STRAIT**, 300 miles long, and from 60 to 240 miles broad, separates the islands of Celebes and Borneo. The western side is much frequented by vessels bound to China late in the season.

**MACAULAY, THOMAS BABINGTON, LORD MACAULAY**, historian, poet, man of letters, and statesman, was born 25th October, 1800, at Rothley Temple, in Leicestershire. He was the son of Zachary Macaulay, a wealthy merchant, whose indefatigable devotion to the cause of the emancipation of the negro was rewarded after his death by a tomb in Westminster Abbey. After the usual course of instruction under a private tutor, he was sent to Trinity College, Cambridge, where his remarkable mental powers immediately attracted notice, and served to gain for him a fellowship which was afterwards of great service. Destined for the law, he was next entered at Lincoln's Inn. In 1826 he was called to the bar, but he thenceforth virtually abandoned the legal profession.

In the preceding year (1825) his essay on Milton had appeared in the *Edinburgh Review*. Its brilliant style, solid criticism, and extensive information produced an instantaneous impression that a new and superior luminary had risen upon the literary horizon. This essay was the first of a series which was continued for fifteen years with constantly increasing excellence. The most able and interesting are those on Milton, Addison, Hallam, Pitt, Bacon, Byron, Chatham, Frederick the Great, Johnson, and Gladstone.

A warm partisan of pure Whig principles, which colour all his writings and influence his estimates of the men and deeds of the past, he was called at a comparatively early age to play an important part in the political world. He entered Parliament in 1830 as member for Calne, and participated in the violent debates which attended the introduction of the celebrated Reform Bill. His speeches were characterized by forcible reasoning and felicitous

illustration, and he defended Earl Grey's measures with so much vigour and effect that he was offered the secretaryship of the Board of Control. In 1832 he was returned to the reformed House of Commons for the important borough of Leeds. Two years later he resigned his seat to proceed on a mission to Calcutta, where, as member of the Council and president of the Legislative Council (1834), he carried out numerous reforms in the Indian laws. In the face of a bitter and unscrupulous opposition, he passed an Act which submitted to the jurisdiction of the local courts the civil affairs of the English scattered throughout India, and consolidated various heterogeneous statutes into a harmonious whole, which was known as the Macaulay Code.

Soon after his return to England (1839) Lord Melbourne conferred upon him the post of secretary at war, which he held until the downfall of the Whig ministry in 1841. In 1840 he had been returned to Parliament by the electors of Edinburgh. He continued to represent the Scottish capital until 1847, when he was unseated on account of the liberal vote which he had given in favour of the Maynooth College endowment. Macaulay was keenly sensible of the injustice done him, and retired for a time from Parliament to devote himself to his favourite studies. At the instance of Lord John Russell, however, he held the office of quartermaster-general, which he had accepted in 1846, with a seat in the Privy Council, until 1848. In the latter year he was unanimously elected Lord Rector of Glasgow University; and in 1852 Edinburgh again returned him to Parliament, without the slightest solicitation on his part, or without his even having promised to accept the office if he were elected.

Notwithstanding his parliamentary and official labours, Macaulay had found time to prepare his "History of England," the work by which he is best known, the first volume of which appeared in 1848. Blending in his narrative traits, pictures, allusions, biographical sketches, and even classical quotations, he troubled himself but little, as he said in his preface, about what is called the dignity of history, so long as he succeeded in conveying to his readers an exact knowledge of the public and private life of their ancestors. Nor did he pretend to absolute impartiality. He could not but profess for the heroes of liberty, for the patriots who had bled and suffered that England's freedom might be established on an eternal basis, that earnest admiration which he felt, and he lauded their achievements as warmly as he denounced the tyranny or bigotry of their oppressors. His History, therefore, has not escaped the attacks of political critics, and Tory writers have laboured to impugn many of his conclusions. It cannot be said, however, that he has been convicted of misrepresentation except in two instances; and even his warmest admirers must admit that he has failed to do justice to the memory and fame of William Penn and John, duke of Marlborough.

The gradual decline of his health, and the immense research necessitated by a historical work conducted on such novel principles and laid out on so elaborate a scale, prevented Macaulay from continuing his enterprise with any great rapidity. It was not until 1855 that the third and fourth volumes of his History appeared, and these only carried the reader down to the peace of Ryswick in 1697.

As a poet, Macaulay's fame will rest on his "Lays of Ancient Rome," his "Armada," "Irry," "Naseby," and "Moncontour." In other departments of poetry he would probably have failed through his very affluence and prodigality; his prize poems and some of his early writings show that, like Tarpeia, the weight of his golden spoils would have crushed him. But the essence of the ballad, as an accomplished critic remarks, is simplicity—simplicity not inconsistent with the richest word-painting. The *vidua vis*—the life, force, movement—conspicuous in all

Macaulay's writings, are displayed in his ballads with singular success, so that in English literature, and in their own peculiar line, they are unrivalled. They have called forth a host of imitations, but none have even approached their excellence. It must not, however, be supposed that Macaulay was a poet in the higher sense of the word, but he possessed the poetic faculty, and it is this which enhances the rare and surpassing merits of his prose.

In 1857 he was raised to the peerage, a tribute, it has been said, to his high and blameless character and literary distinction, and an act of royal favour quite unexpected, but highly approved by all whose approbation was of real value. Though he took his seat in the House of Peers, he never spoke in that "august assembly."

Macaulay was never married. Yet was he a man of strong domestic affections, and he lavished a wealth of love on the children of his sister, Lady Trevelyan. He was a warm friend and a generous opponent, and it may be truthfully said of him that in all his political life he excited no lasting enmity.

His last years were harassed by the distressing symptoms of pulmonary disease, and his friends and admirers saw with deep regret that there was little chance of his living to complete the colossal work on which, as on a monument more enduring than brass—*monumentum ære perennius*—he had hoped to establish the superstructure of an enduring fame. Yet his end, when it came, came suddenly and unexpectedly. He fell asleep, as tranquilly as he had lived, on the 28th of December, 1859, in the sixtieth year of his age. On the 9th of the following January his remains were honoured with interment in Westminster Abbey.

There is a common impression that in society Macaulay was engrossing and overpowering. Every one has heard the witty saying of his old friend Sydney Smith (no two men could appreciate each other more highly or more justly) about "flashes of silence." But in the quiet intercourse with a single friend, no great talker was more free, easy, and genial than Macaulay. There was the most equable interchange of thought; he listened with as much courtesy as he spoke with gentle and pleasant persuasiveness. In a larger circle, such as he delighted to meet and assemble around him to the close of his life, a few chosen intimates, some accomplished ladies, foreigners of the highest distinction, who were eager to make his acquaintance, his manners were frank and open. In conversation in such a circle, a commanding voice, high animal spirits, unrivalled quickness of apprehension, a flow of language as rapid as inexhaustible, gave him perhaps a larger share, but a share which few were not delighted to yield up to him. His thoughts were like lightning, and clothed themselves at once in words. While other men were thinking what they should say, and how they should say it, Macaulay had said it all, and a great deal more. And the stores upon which his memory could draw seemed inexhaustible. A wide range of Greek and Latin history and literature, English, French, Italian, Spanish; of German he had not so full a stock, but he knew the best works of the best authors; Dutch he learned for the purpose of his History. With these came anecdotes, touches of character, drollery, fun, excellent stories excellently told.

"The Life and Letters of Lord Macaulay" (London, 1876), by his nephew, Sir George Otto Trevelyan, is one of the most fascinating biographies of our time.

**MACAW** (*Macrocerus*) is a genus of birds belonging to the order **PATRACI**, which contains the parrots and their allies. The macaws are confined to tropical America, ranging from Paraguay to Mexico, and only one species at the present day is found in the West Indies. The macaws are for the most part big showy birds with large bills and long tails; the upper mandible is much curved, and the skin which covers the cheeks is nearly naked, being clothed

with only a few scattered minute hairs. From their size, brilliant plumage, and good temper these birds are favourite pets. The natives of South America give the general name of *Ara* or *Araraca* to the macaws, a denomination which is evidently in imitation of their note. Hence some ornithologists prefer the generic name *Ara*, while others use a third generic title, *Sittace*.

The Scarlet or Red and Blue Macaw (*Macrocerus macao*) is the largest of the group, measuring sometimes as much as 3 feet from the bill to the tip of the long tail. It also surpasses the rest in magnificence of plumage. The principal portion of the plumage is of a bright scarlet colour; the quill-feathers of the wings are of a fine blue; the greater wing-coverts are yellow, tinged with green; the upper and under tail-coverts are blue, the two middle feathers of the tail crimson, and the remainder of the tail-feathers, which gradually decrease in length towards the sides, are partly red and partly blue. The feet are dusky black, the naked skin of the cheeks wrinkled and white, the upper mandible whitish, and the lower one black or dusky.

This splendid bird inhabits Central and South America as far as Bolivia. It dwells in pairs or in small family parties in the depths of the forests, generally taking up its abode about the palm-trees, upon the fruits of which it to a great extent subsists. The nest of this species is made in a hollow tree, and the bottom is lined with feathers. It has two broods in a year, and lays two eggs at each time; these are white in colour and about the size of pigeons' eggs. The young birds are tolerably easily tamed, although they do not exhibit the docility of many other parrots, and rarely learn to speak, even indistinctly. The great beauty of their plumage, however, causes them to be highly valued, notwithstanding the excessive harshness of their cry; and in former times a specimen of this bird was not an unacceptable present even to royalty itself.

The Blue and Yellow Macaw (*Macrocerus ararauna*) is another large and beautiful species. The upper surface is of a rich blue, and the lower yellow; the long graduated tail is blue above and yellow beneath; there is a large black patch on the throat, and the bill is of the same colour. Artificial flies for salmon fishes are largely made of the feathers of the tail. It is more docile than the scarlet macaw. Another species, somewhat rarer in collections, is the Red and Yellow Macaw (*Macrocerus chloroptera*), which ranges from Panama to Brazil. The Red and Green Macaw (*Macrocerus militaria*) is remarkable for extending as far north as Mexico. It is smaller than the last species. The general colour of the plumage is a fine green, changing into blue on the upper surface; the forehead bears a crimson band; the wings, rump, and upper tail-coverts are bright blue; and the tail-feathers are scarlet. Some ten or twelve other species are known, all comparatively rare in captivity: one of these (*Macrocerus tricolor*) is peculiar to Cuba. So far as is known the habits of all the macaws are similar to those described for the scarlet macaw.

**MACAW-PALM.** See **ACROCOMIA**.

**MACBETH** or **MACBETHAD MACFINLEGH**, as the chroniclers call him, whose name is immortalized by Shakespeare's tragedy, was at first *maormor* or ruler of the province of Moray, and by marriage with the granddaughter of King Kenneth Macduff became allied to the older royal family. He took up arms against King Duncan M'Crinan, grandson of Malcolm II., who had killed King Kenneth and usurped his throne. Macbeth succeeded the "gracious Duncan" as king of Scotland, on Duncan's defeat and death in battle, near Elgin, in 1089. In his administration he displayed great energy, no ordinary ability, and a fervent love of justice; but the partisans of the Duncan dynasty rose against him, and, assisted by Siward, the Danish earl of Northumbria, and Macduff, the *maormor* of Fife, defeated him at Dunsinane Hill in



Perthshire, in 1054. It was not on this occasion, however, nor by the hand of Macduff, the man "not of woman born," that Macbeth fell. He was defeated and slain in fair fight, at Lumphanan in Aberdeenshire, in 1056, after a reign of seventeen years, and Malcolm Canmore, son of Duncan, succeeded, after a brief attempt to retain the crown on the part of Macbeth's nephew.

The legend of the murder of King Duff by his vassal Donwald and his wife when on a visit to them at Forres, which Shakspeare found in Holinshed's "Chronicle History of Scotland," he skillfully interwove with the account of Duncan's assassination by Macbeth, which Holinshed substitutes for the king's death in battle. The witches' prophecy, the murder of Banquo, and the other main incidents of the tragedy are all to be found in the pages of the old chronicler, who had in his turn copied it from the still earlier work of Boece (1527). Gruach, Lady Macbeth, the princess of history, not of poetry, was, as is shown above, the representative of the true line, Duncan of the usurping family. The historical (not Shakspeare's) Macbeth had thus a warrant for rebellion.

**MACCABEES**, the name given to a Jewish family celebrated for their heroic resistance to the oppression of the Greek kings of Syria in the second century before the Christian era. The original of the term has been variously derived, one account finding it in the combination of the initial letters of the Hebrew sentence, "Who among the gods is like unto thee, Jehovah?" (Exod. xv. 11), and another in the cognomen of Makkabis (hammer) assumed by a prominent member of the family.

When by the efforts of Antiochus IV., and the indifference of the mass of the Jews, the worship of Jehovah seemed about to give way to the adoration of the deities of the Greeks, Mattathias, a priest who had withdrawn in sorrow from the desecrated temple and city of Jerusalem to the small town of Modin, gave the signal for revolt (B.C. 167) by killing with his own hand a renegade Jew who was about to offer idolatrous sacrifice. In the tumult occasioned by this act the Syrian officials were also slain, and Mattathias with his five sons, John, Simon, Judas, Eleazar, and Jonathan, took refuge in the desert country of Judea. Here they were joined by many courageous and resolute adherents of the old faith, and an irregular warfare was commenced against the Syrians. Well acquainted with the country, and assisted by their friends in the towns and villages, they were able to surprise and destroy several of the small armies sent against them, and wherever they obtained the upper hand they threw down the heathen altars and temples, circumcised the children, and reestablished the worship of Jehovah. On the death of Mattathias (B.C. 166) the command of the insurgents was assumed by his son Judas, whose victories over the superior numbers of the enemy were so striking and effectual that he was enabled to take possession of Jerusalem (B.C. 164), purify the temple, and reconsecrate it to the service of Jehovah. In commemoration of this act a feast, the feast of the Dedication of the Temple, was afterwards annually observed by the Jews. Judas was subsequently besieged in Jerusalem, but was saved by the withdrawal of the Syrian general, and later he endeavoured to obtain the protection of Rome for the new Jewish state. His embassy was favourably received, but before it returned Judas fell in battle, fighting to the last against overwhelming numbers of the Syrians. The command then devolved upon Jonathan, who renewed the treaty with Rome, took an important part in the dispute between the rival claimants for the Syrian throne, and obtained from one of them the appointment of high priest. He was murdered by the orders of Tryphon, the guardian of the young prince Antiochus Theos (B.C. 143), and was succeeded by his brother Simon, who in his capacity of high priest and chief ruler of the Jews obtained recognition both from the Syrians and

Romans, and who ruled the land with much justice, mildness, and wisdom for over seven years. The quiet prosperity of these years caused the reign of Simon to be long remembered as a bright spot in the later history of the Jews, the periods before and after being marked with much turbulence and bloodshed. Simon was treacherously murdered along with two of his sons (B.C. 135) by his son-in-law Ptolemy, and was succeeded by his son John Hyrcanus, who renewed the alliance with Rome, and captured and destroyed (B.C. 109) the fortified city of Samaria. After his death (B.C. 106) his eldest son Aristobulus I. reigned for one year, and he was followed by Alexander Jannæus (B.C. 105-78), a vindictive and bloodthirsty warrior; the wife of the latter, Alexandra (B.C. 78-69), who ruled according to the counsels of the Pharisees; Aristobulus II., who had to contend for the throne against his brother Hyrcanus, and who, after being sent a prisoner to Rome, was poisoned on his way back (B.C. 46); and Hyrcanus II. (B.C. 46-30). Mariamne, the proud and beautiful wife of Herod, may be called the last of the Maccabean family. She became the wife of Herod (B.C. 30), and was put to death by his orders, B.C. 26.

**MACCABEES, THE BOOKS OF THE.** Five books have come down to us under this title, of which three are still reckoned among the canonical Scriptures by the Eastern Church, and two by the Roman Catholic Church, but which are all rejected as apocryphal by the Protestant churches. *The First Book of the Maccabees* contains the history of the Jews during forty years, from the accession of Antiochus Epiphanes, B.C. 175, to the death of Simon, B.C. 135. The original, according to the unanimous testimony of the fathers, was written in Hebrew, but this version has long been lost, and the book has been preserved by means of the Greek translation. From internal evidence the book is ascribed to a Palestinian Jew, and though its date is uncertain it is generally placed by scholars between B.C. 120-100. The writer appears to have had access to official records and the narratives of eye-witnesses, and his history bears throughout the marks of honesty and candour. *The Second Book of the Maccabees* is avowedly the abridgment of an earlier work in five books, by one Jason of Cyrene, which had been compiled from various sources. It begins with two epistles supposed to be addressed by the Palestinian Jews to their brethren in Egypt, inviting them to celebrate the feast of the reinauguration of the temple. These are certainly spurious and of late date, and the history, though it begins a few years earlier than the first book, is mainly a repetition of the latter, mingled with observations of a moral and religious character. It is less trustworthy than the first book, and it plainly bears the stamp of being written for a religious purpose. It appears to be the work of an Alexandrian Jew, and to have been originally written in Greek. *The Third Book of the Maccabees* records a persecution of the Alexandrian Jews by Ptolemy IV. Philopator, and of their deliverance by Divine interposition and the ultimate repentance of the tyrant. It is quite unhistorical in its character, and the events it records refer to a time earlier than that of the Maccabees, but it is still read in the Eastern Church. *The Fourth Book of the Maccabees*, also known by the title, *On the Supreme Sovereignty of Reason*, contains chiefly a fuller history of the martyrdom of Eleazar, of the seven brothers, and of their mother, which forms the subject of 2 Macc. vi. vii., and the author uses these incidents to illustrate the sovereignty of pious reason over the passions. The authorship of this book was ascribed by Eusebius and Jerome to Josephus, but modern scholars reject this theory, and nothing certain is known as to its origin. *The Fifth Book of the Maccabees* only exists in Arabic and Syriac. Its history extends from the attempt of Heliodorus to plunder the temple to within a few years of the birth of



Christ. The writer has made use of the two books of the Maccabees and of Josephus, and has no claim to be considered an independent authority.

**MACCLESFIELD**, a municipal borough of England, in Cheshire, 171 miles from London by the North-western Railway, and 17 miles S.S.W. of Manchester, is situated on the west side and at the base of a range of high land which is on the borders of Cheshire and Derbyshire, and is a part of the mountain region of the latter county. The Bollin, an affluent of the Mersey, runs through the town. A canal, which unites the Grand Trunk and Peak Forest canals, passes close to Macclesfield, and thus opens a water communication with most parts of England. The town has also good railway accommodation. There are four principal streets, diverging from the market-place in various directions, and a large number of smaller ones. Considerable improvements have been carried out in various parts of the town during recent times. The guildhall is a modern Greek edifice, of graceful design, and the public room is well adapted for concerts and meetings. A subscription library contains about 20,000 volumes, and in 1876 a fine library, comprising a building and 10,000 volumes, was presented to the town by Mr. Chadwick, M.P. The town also contains a large hospital and infirmary, built in 1871, to which a new ward was added in 1884, a free grammar-school, founded in 1502, and rebuilt in 1866. A public park of 16 acres has been laid out, and a cemetery was opened in 1866. The sanitary condition of the town is excellent, and the death-rate usually low.

St. Michael's Church was founded by Eleanor, queen of Edward I., in 1278. There are several other churches in the town, and in each of the suburbs, Sutton and Hursfield. There are also various places of worship belonging to different classes of dissenters.

Macclesfield is one of the chief seats of the silk-throwing trade, which is not so flourishing as formerly, but still employs upwards of seventy mills. Every variety of silk article is produced here, from the narrowest ribbons to the different kinds of sarsonets, plain and figured gros de Naples, satin, silk vestings, and velvets. It is likewise the chief place for the manufacture of silk handkerchiefs of every description. The factories are situated on the Bollin, and are in general very large and fitted with power-looms, but in a few hand-looms are still employed. In addition to the silk manufactories there are also some cotton factories in the town. The town has two weekly markets, and five annual fairs.

Macclesfield was incorporated by a charter of Prince Edward, son of Henry III., in 1261, and subsequently by various sovereigns of England. It is divided into six wards, and is governed by twelve aldermen and thirty-six councillors. The population in 1881 was 87,514. Macclesfield was formerly a parliamentary borough, but was disfranchised for corruption in 1880.

**MACDUFF**, a burgh of barony and seaport of Scotland, in the county of Banff, situated a mile from Banff, and 49 miles N.N.W. of Aberdeen, on the Moray Frith. The town is built on ground rising from the sea-shore, and is a favourite bathing resort. The harbour is suitable for small vessels, and was much improved in 1877. It is the private property of the Earl of Fife, whose residence is in the vicinity. Some export trade is carried on in grain and cured herrings; and coal and manures are imported. The principal buildings are the Established church, Free church, Congregational church, and a town-house. Previously to 1788 the place was called Downe or Doune, but it was then changed by the Earl of Fife to the family name Macduff, and its present prosperity has been attained by the aid of his successors. The population in 1881 was 8641.

**MACZ**, a short staff with a large heavy head (the old French *masse*, derived from the Latin word for a wooden beetle or mallet), a weapon of war in the dark

ages, especially favoured by knights in armour, as more effective against armour than the sword, and less cumbersome than the lance. Hence it grew to be a symbol of command, being the appropriate weapon for a commander (as for instance, William the Conqueror at the battle of Senlac or Hastings); and for state purposes it still serves in that capacity. The mace of the city of London (Sir William Walworth struck down Wat Tyler with his mace before despatching him with his dagger) and that of the House of Commons ("this bauble," as Cromwell called it when dismissing the Rump) are the two most celebrated state maces.

**MACE**, a Chinese coin, is the tenth of a Chinese *tael*, and is worth about 7d. English.

**MACE** is the crimson covering of the nutmeg, the whole being inclosed in a fleshy fruit. When the fleshy part is removed the mace is stripped from the nutmeg and dried, in this state constituting the well-known spice. The mace is botanically considered as the *Axis*, while the nutmeg is the seed. See **NUTMEG**.

**MACEDONIA**, an ancient country lying to the north of Thessaly. In the days of Strabo the boundaries included a considerable part of Illyria and Thrace; but Macedonia Proper was separated from Thessaly on the south by the Cambunian Mountains; from Illyria on the west by the great mountain chain called Scardus and Bernus, and which, under the name of Pindus, also separates Thessaly from Epirus; from Mœsia on the north by the mountains called Orbelus and Scamius, which run at right angles to Scardus; and from Thrace on the east by the river Strymon. The Macedonia of Herodotus was still more limited. Macedonia Proper, as defined above, is watered by three large rivers, the Axios (*Vardar*), the Lydias, and the Haliacmon, which flow into the Thermoic Gulf (the modern Gulf of Saloniki). The whole of the district on the sea-coast, and to a considerable distance in the interior, between the Axios and the Haliacmon, is low and marshy. The only other rivers of any importance were the Strymon and the Angites, whose valleys were separated from that of the Axios by a range of mountains which run from Orbelus on the north towards the peninsula of Chalcidice. The Strymon (*Struma*) rises in Mount Scamius, and flows into the Strymonic Gulf (*Gulf of Orphanos*). Not far from the sea it forms a lake, called Cerciniitis (*Kerkine*), into which the Angites flows from the eastward.

The Macedonians were probably an Illyrian people, though it appears that their princes were an Hellenic race, and parts of the country were inhabited by Hellenic tribes from an early period. Perdicas is usually regarded as the founder of the kingdom, the limits of which were confined to the country in the neighbourhood of Kdessa, between the Lydias and the Haliacmon. Very little is known of its history till the reign of Amyntas I., who was king at the time of the expulsion of the Pisistratidæ from Athens, B.C. 560. Amyntas was succeeded by his son Alexander I., who was obliged to accompany the Persian army into Greece, but was able to render important services to the Grecian cause. The time of Alexander's death is uncertain, but he lived at least to B.C. 468. He was succeeded by Perdicas II., who took an active part in the Peloponnesian War, and alternately assisted Athens and Sparta. His successor Archelaos, Lat. *ARCHELAUS* (B.C. 413) was the wisest king that had till then sat upon the throne of Macedonia.

On the assassination of Archelaos, 399 B.C., confusion prevailed for many years; and it was not till the accession of Amyntas II. (393 B.C.) that order was restored. Amyntas was succeeded by his eldest son Alexander II., who was assassinated at the end of the first year of his reign by Ptolemy Alorites, who was regent for three years during the minority of Perdicas; but in consequence of abusing his trust he was cut off by Perdicas, 364 B.C. Perdicas, after a reign of five years, fell in battle

against the Illyrians, 359 B.C., and was succeeded by his younger brother, the celebrated PHILIP. Philip was succeeded by ALEXANDER THE GREAT. In the disturbances which followed the death of Alexander the royal family was destroyed, and Cassander obtained at first the power, and eventually the title, of king of Macedon. Cassander was succeeded by his son Philip, 296 B.C., who reigned two years; and on his death, in 294 B.C., his two younger brothers, Antipater and Alexander, having quarrelled respecting the succession, the throne was seized by Demetrius, the son of Antigonus, who reigned seven years. He was driven from his kingdom 287 B.C., by Pyrrhus, king of Epirus, who was deposed, after a reign of seven months, by Lysimachus, king of Thrace.

On the death of Lysimachus, in 281 B.C., the country remained in a state of anarchy for a long period. Eventually, Antigonus (surnamed *Gonatas*), the son of Demetrius, was proclaimed king, but was dethroned by Pyrrhus, who again obtained the kingdom on his return from Italy. After the death of Pyrrhus, Antigonus regained possession of the throne, which he retained till his death, 239 B.C. The two following kings, Demetrius II. (239-229 B.C.) and Antigonus II. (229-220 B.C.), were principally occupied in Grecian wars.

Philip V., who succeeded Amyntas, alarmed at the increasing power of the Romans, entered into an alliance with Hannibal. On the conclusion of the war with Carthage he was unable to cope with the Roman power, and after continuing the contest for a few years, was obliged to sue for peace. Philip was succeeded by Perseus, 178 B.C., who carried on war against the Romans, and was finally conquered 168 B.C. Macedonia was divided into four districts, which were considered independent, and governed by their own laws, and of which the capitals were respectively—Amphipolis, Thessalonica, Pella, and Pelagonia. Macedonia was reduced to the form of a Roman province, 142 B.C. The term Macedonia is still applied to the southern portion of Rumelia and part of Selanik, or Saloniki.

**MACERATION** is the steeping of substances in cold liquids, either to soften the parts of the substance operated on, or to dissolve its aromatic parts when digestion would not merely dissolve but dissipate them.

**MACFARREN, SIR GEORGE ALEXANDER**, the foremost English musician from Sterndale Bennett's time to his own death. His father was a dramatist. George was born in London, 2nd March, 1818. He early displayed ability for music, and was sent to the Royal Academy when sixteen years old to study for the profession of which later on he was to become the head. In 1834 he became professor at the Academy, and at once began to produce important orchestral works ("Chevy Chase Overture," 1836). In 1838 he wrote his first opera ("The Devil's Opera"), which had great success. Henceforward his career was assured. His operas have not survived, but they were all well received at first. Of his cantatas "Lenora" (1851) and "May Day" (1856) are the two most popular, and are often heard. About 1865 Macfarren became blind, but he continued diligent in his profession, dictating to an amanuensis and working at the Royal Academy. In 1875 he was elected to succeed Sterndale Bennett, both as professor of music at Cambridge University, and as principal of the Royal Academy of Music. In April, 1875, he became Mus. Doc. of Cambridge. His mind had now turned towards oratorio; and he successively produced his excellent works "John the Baptist" (Bristol Festival, 1873); "Resurrection" (Birmingham Festival, 1876); "Joseph" (Leeds Festival, 1877). In the year 1883 he received the honour of knighthood. In everything he showed the same sturdy independence and unwavering adherence to what he felt right. His vigorous rule raised both the musical examinations of the University of Cambridge and the whole institution of the Royal Academy to a reputation greater

than either had enjoyed before; and he was universally respected. His great knowledge enabled him easily to produce "analytic programmes" for the Philharmonic Society, and so to confer untold benefit on concert-goers by inaugurating a practice now almost universal. His "Lectures on Harmony" (1867), and his splendid treatises on "Harmony" (1860), and "Counterpoint" (1879), are models of learning and clear exposition: and with these works, by his own unaided strength, Professor Macfarren overturned the old empirical system of harmony in favour of the reasoned principles of Alfred Day—principles, we may add, adopted throughout the present work. Sir George Macfarren died in November, 1887, and was buried at Hampstead.

**MAC-FLECK'NOE.** See SHADWELL.

**MAGGIL/LYCUDDY REEKS**, the highest mountain ridge in Ireland, extending N.W. to S.E. for 10 miles through the county of Kerry. Curra-Tual, or Gurra-Tual, the highest peak, is 3414 feet above the sea-level. It is composed of Silurian slate with fossils.

**MACHIAVELLI, NICCOLO DI BERNARDO DEI**, was born at Florence in 1469. When twenty-nine years of age he was made secretary of the "Ten," a board which had the management of war and foreign affairs. His abilities and penetration being soon perceived by his superiors, he was successively employed on many and some very important missions. In the year 1500 he was sent as a commissioner to the Florentine camp before Pisa, and subsequently to Paris to conciliate the king towards the Florentines. On both occasions his labours were crowned with success.

In 1502 he married; and in this same year Piero Soderini was elected gonfalonier for life, on the model of the Doge of Venice. Machiavelli was despatched as ambassador to the Duke of Valentinois, the formidable Cesare Borgia (son of Pope Alexander VI.), who was then at Imola in Romagna, to make professions of friendship on the part of the Florentines. In 1503 they again sent Machiavelli to Rome, where he was present at the election of Pope Julius II., and soon after witnessed the fall of Cesare Borgia. In 1506 he carried through a scheme for a kind of conscription over the whole of the territory subject to Florence, was appointed secretary of the commission, and spent about two years forming this new militia. After visiting France, Rome, and some other places, on various missions, Machiavelli was sent in 1507 to the Emperor Maximilian in Germany. On his return he wrote several reports on the affairs of Germany. Machiavelli was sent to France, and returned to Florence in September, 1510, having consolidated the alliance of Florence with France.

When, in 1512, the Medici possessed themselves of Florence, Machiavelli, with others of the popular government, was banished, and subsequently imprisoned and put to the torture on suspicion of being implicated in a conspiracy against the Medici. He persisted in declaring himself innocent, and was released by the intervention of Leo X. He then withdrew from public life to a small farm of his own near San Casciano, and wrote his discourses upon Livy, his books on the art of war, and his "Prince." This is the world-famous book which has done more to blacken the character of Machiavelli than all his acts and other writings put together. He finished it and dedicated it to Lorenzo, duke of Urbino, as early as 1513; it was not published, according to the best evidence, till 1532, after the author's death. Viewed dispassionately and as what it professes itself to be, it is a manual of policy for the sovereign of a newly-acquired territory desirous of settling and extending his power. It tells him, from the experience of past history, how this can be most surely done, and asserts, without subterfuge and without revulsion of feeling, that the surest

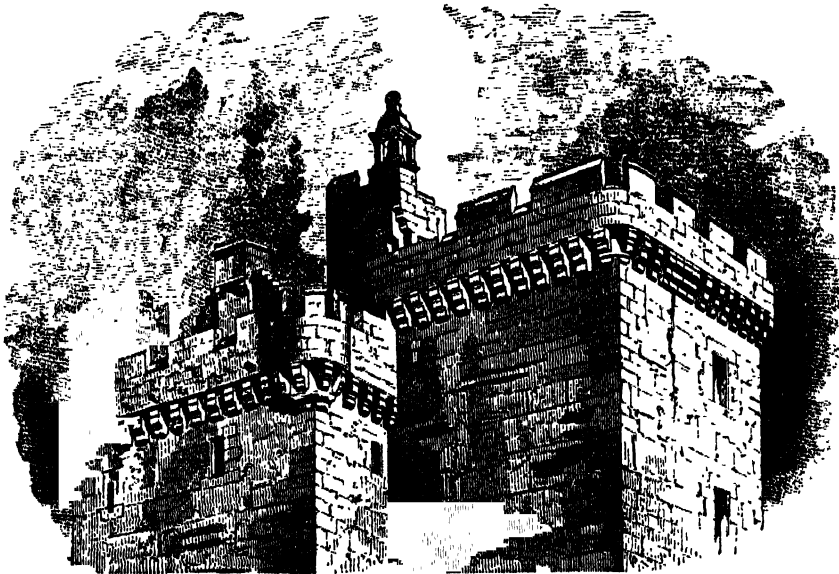
method is one which cannot fail oftentimes to violate moral principle. It cites Cesare Borgia as an example, in some respects, of successful policy. On the whole the book tends to identifying the interests of the prince with those of the country. It is certainly not a moral book; but is properly to be viewed rather as a disquisition proceeding upon other than moral data, than as a preaching of immorality. By some his principles have been stigmatized as the most pernicious maxims of government, founded on the vilest policy, and by others as sound doctrines, notwithstanding the prejudice erroneously raised against him. Machiavelli himself said, if he taught princes to be tyrants he also taught the people to destroy tyrants.

In 1519 the Medici Pope (Leo X.) was uneasy at the disturbed state of Florence, and consulted the leading men as to what form of constitution would best settle the state. Machiavelli was applied to with the rest, and wrote in reply the "Discorsa sopra il Riformar lo Stato di Firenze." In 1520 he wrote a military treatise and a sort of by-commentary on the "Prince," the "Life of Castruccio;" and began, by command of the Cardinal Giulio de' Medici (afterwards Pope Clement VII.), a history of Florence. He worked at this six years, and dedicated the portion then finished to Pope Clement. He was still at work on it when he died in 1527. In these last years he also turned to dramatic work, and after a few translations from the Latin, &c., he produced his remarkable original drama, "Mandragola" (1524), surely the finest and most powerful play in the whole language, though most unpleasing, if not revolting, in plot. In fact Machiavelli seems to have been wilfully or naturally blind to the moral side of life in his writings, though himself an ardent patriot and a man of decent life and of generous impulses. Or we may say, with his defenders, that finding himself in the essentially pagan times of the Renaissance, he set to work

(in his Livy and elsewhere) to teach at least some of the virtues of paganism, and correct the mere imitation of its vices which prevailed, and left aside the teaching of the higher morality which his life and sacrifices show him to have been conscious of, as being incompatible with the ordinary manners of the period. Yet the principle underlying his whole works, that the end justifies the means, is, and in its nature must be, deeply immoral. Machiavelli never says that it is or is not so, he only asserts that such and such conduct will lead to power, and that a strong central power will liberate the faction-torn Italy. In this respect he is one of the most fascinating studies history has ever presented to the psychologist. His novel "Belfagor" (printed with the "Prince" in a translation, is one of the volumes of Morley's Shilling Library, 1884) is more pleasing than his play in plot, and equally fine in its writing. In 1526 Machiavelli had to report to Pope Clement on the fortifications of Florence, and with this view he visited Guicciardini, the Pope's commissary of war, a visit renewed in 1527. Thus the two greatest historians of Italy passed some time together. Unhappily no record of their conversations was kept by either. After his return to Florence in 1527 Machiavelli fell suddenly ill, and in two days died. He is buried in the Westminster Abbey of Italy, the church of the Santa Croce at Florence, and the proud inscription has been accorded him by an admiring posterity, *Tanto nomini nullum par elogium* (No praise is worthy enough for so great a name).

The best translation of Machiavelli's works, four volumes, is by Detmold (Boston and London, 1882). The authoritative book on Machiavelli himself is "Niccolò Machiavelli and his Times," four volumes, by Professor Villari (translated, London, 1884).

**MACHICOLA'TION**, a term applied to those open-



Clackmannan Tower (Scotland), with machicolated battlements.

ings in the floor of a projecting parapet of a fortified building through which ignited combustibles, melted lead, stones, &c., were poured and hurled down upon the besiegers. The besieged were protected by the parapet.

**MACHINE**, an object by the intervention of which a motive power is made to act upon any body, and overcome

the force by which the latter resists the effort to change its state of rest or motion. The advantage which any machine affords for overcoming resistance consists in the reaction by which it supports a certain portion of the weight producing that resistance, so that the motive power has only to counteract the remainder. This may be im-

mediately observed in those simple machines called the MECHANICAL POWERS.

The whole work done by a machine is distinguished into useful work and wasteful work, according as it is done in overcoming useful and wasteful resistance. For example, in a pumping engine, the work done in raising the water is useful, and that done in overcoming friction wasteful. The ratio of the useful work to the whole work is called the *efficiency* of the machine, and is always a fraction less than unity.

**MACHINE, ELECTRICAL.** See ELECTRICITY.

**MACHINE-HEAD,** a contrivance for assisting the tuning of the contrabasso (double bass), guitar, &c. The ordinary violin-pegs are discarded in favour of a metal frame containing as many rack-and-pinion arrangements as there are strings to be tuned. The greater leverage and security give the requisite ease and stability to the tuning.

**MACHINES, CALCULATING.** See CALCULATING MACHINES.

**MACHINES, SIMPLE,** another name for MECHANICAL POWERS.

**MACINTOSH CLOTH** (so called from the inventor) is a singular but very useful manufacture, consisting of two layers of fine cotton, cemented with a solution of caoutchouc in coal naphtha, or liquid india-rubber, and so completely conjoined as to appear one material. The cotton pieces, thus coated with the liquid, are passed between two smooth wooden rollers, and so thoroughly pressed as to be made to unite permanently and durably. Cloth thus prepared, when perfectly dried, may be cut and made into garments which will bear the roughest wear, and be impervious to the most soaking rains. For travelling overcoats they are of great service.

**MACKINTOSH, SIR JAMES,** historian, statesman, critic, and philosopher, was born at Aldourie, on the banks of Loch Ness, 24th October, 1765. He received his education at the universities of Aberdeen and Edinburgh, came to London, and was called to the bar in 1795. In 1804 he went to India as recorder of Bombay. He returned to England in 1812; in 1818 he was appointed to the professorship of law and general politics in the college instituted for the education of the civil servants of the East India Company at Haileybury. In 1830, when the Whigs came into office, Sir James was appointed a commissioner for the affairs of India. He died 30th May, 1832.

Sir James' principal works are his "Vindiciæ Gallicæ;" his "History of England" (which he left unfinished at his death); his "Dissertation on the Progress of Ethical Philosophy," prefixed to the *Encyclopædia Britannica* in 1830 and in subsequent editions; and his "Life of Sir Thomas More." As a philosopher Mackintosh does not show much originality. He adopts the doctrines of the Scotch school, with certain additions as to ethical theory from Hartley. His chief difference from the latter is his claim of the will as a necessary condition preceding moral sentiments, so that the conscience of each man results from his individual training in society. He admits that the tendency to happiness is the mainspring of the excellence of virtue; but he declines to take resultant happiness as a criterion of virtue, as do the utilitarians.

**MACKENZIE,** the name of a large river in British North America, rising in the Great Slave Lake, and running in a north-westerly direction, enters the Atlantic by several mouths, about 68° 50' N. lat. Forts Simpson, Norman, and Good Hope are on its banks. The Mackenzie is estimated to be 870 miles long, though from the source of the Slave River, the principal feeder of the Slave Lake, to the ocean is over 1770 miles. An extensive deposit of lignite accompanies its course and its estuary westward. It takes its name from its discoverer, Alexander Mackenzie, by whom it was first navigated in 1789. Its navigation is closed by ice from October to June.

**MAC'KEREL** (Scomber) is a genus of fishes belonging to the order Acanthopterygii, and forming the type of the family Scombridae. In the genus Scomber the body is covered with small smooth scales; the dorsal fins are widely separated; the hinder part of the second dorsal, as well as of the anal fin, is divided into numerous small spurious fins or finlets, which extend along the hinder part of the body, above and beneath, almost to the tail; the sides of the tail are keeled, and the body is elongated and tapering at both extremities. There are a row of small conical teeth in each jaw.

The Common Mackerel (*Scomber scomber*) is one of the best known and most useful of the fishes caught off English coasts. The mackerel is found on all the European coasts, and is probably identical with the common North American species. It swims through the ocean in vast shoals, coming into shallow water to spawn. The spawning time in the South of England is about June. The mackerel is usually about 14 or 15 inches in length and 2 lbs. in weight, but a length of 20 inches is sometimes attained. The mackerel, as is well known, is beautifully marked; the back is fine green varied with blue, and marked with about thirty broad, undulating, descending bands of a blackish colour; the sides and belly are silvery, varied with golden tints. The mackerel is extremely voracious, and feeds on the fry of other fishes. As an article of food it is much esteemed. The flesh, however, soon becomes unfit for food, if not eaten quite fresh; and accordingly we find that mackerel were first allowed to be cried through the streets of London on Sundays in 1698. Mackerel are caught in various ways, either by the drift-net or by the seine. [See FISHERIES.] They may also be taken with the hook.

The Spanish Mackerel (*Scomber colinus*) occurs in the Mediterranean and occasionally on the Cornish coast. It is about the same size as the common species, but differs in the longer snout, larger eye and gape, and longer head. The back is marked more obscurely and with fewer stripes, and the sides and belly are thickly covered with small dusky spots. This species also differs from the common mackerel in the possession of an air-bladder. It is inferior for the table. Several other species of mackerel are found in temperate and tropical seas.

In the Plate prefixed to this volume the Common Mackerel (*Scomber scomber*, fig. 1) is figured together with some nearly allied fishes. The Sucking-fish or Remora (*Echeneis remora*, fig. 2) is a remarkable form belonging to the Scombridae, which also contains the tunny, bonito, and pilot-fish. The John Dory (*Zena fischer*, fig. 3) belongs to the family Cyttidae, which for some forms a subfamily of Scombridae. The fish figured in fig. 4 belongs to the genus Brama, one of the Coryphenidae, which is also sometimes ranked as a subfamily of Scombridae.

**MACLEOD, NORMAN, D.D.,** one of the chief ecclesiastics of the Church of Scotland in modern times, was born at Campbelltown, 3rd June, 1812. His early youth was passed partly in that Highland parish which he afterwards made famous by his lively sketches of his grandfather's manse, partly at the universities of Glasgow and Edinburgh, and afterwards of Germany. In 1838 he was ordained minister of London, in Ayrshire, whence he was translated to Dalkeith. There he resided till 1851, when he was presented to the Barony parish in Glasgow, of which the congregation originally worshipped in the crypt of the cathedral, as described in "Rob Roy," and in later times in the large but ungainly church in its neighbourhood. Here the remainder of his life was passed, engaged in the laborious duties of pastoral ministrations and literary work. In 1860 he became editor of *Good Words*, which under his management obtained an unprecedentedly large circulation. He also edited "The Home Preacher, or Church in the House," a collection of religious services for family use,

which has also had a very wide circulation. In 1858 he was appointed one of her Majesty's chaplains, and was held in the highest personal esteem both by the queen and the other members of the royal family. In 1867 he undertook an arduous journey to India to examine into the state of the Scottish missions in that country. It was this journey which gave the first shock to his great natural strength, but he still maintained with undaunted spirit his incessant labours. In the General Assembly, in 1872, held only a very short time before his death, he delivered what seemed to those who heard it the finest of all his speeches. It was on the occasion—forced upon him by his failing health—of giving up the charge of those Indian missions in which he had taken so deep an interest. The effort was too much for him, and he died on 16th June, 1872.

For thirty years prior to his death no other man in Scotland had, in all spiritual ministrations, so nearly filled the place of Chalmers; no other man occupied so high and important a position in guiding the ecclesiastical movements of his country since the death of Robertson—it might almost be said since the death of Carstairs. Everywhere, whether in private or public life, he produced the same broad, vast, heart-stirring impression, as of one who not only had within him an inexhaustible fund of pathos, of wit, of tears, and of laughter, but who feared not, nay, who loved to pour it forth for the enjoyment and instruction of his fellow-men. But with his effusive tenderness were combined a force and a shrewdness characteristic of his sect and nation. ("Memoir of Norman Macleod, D.D., minister of Barony Church, Glasgow;" by his brother, the Rev. Donald Macleod, B.A.: London, 1876.)

**MACLES** (Gr. *machē*, a contest), in mineralogy, are twin crystals which have undergone hemitropism, the two halves bearing a reversed position to each other. Interesting examples of this combination are found in the arrow-head forms of gypsum, and in the Carlsbad type of twinning of orthoclase. Macle is also an alternative name for **CHIASTOLITE**; in this case the name is derived from Lat. *maenula*, a spot.

**MACLISE, DANIEL** (1811-70), an artist of great reputation in his own time, was of Irish birth. His strong point was design, especially of decorative historical subjects; in finer feeling and in colour, and in poetical insight, he was usually strangely imperfect. Yet his "Hamlet" (National Gallery), his "Meeting of Wellington and Blücher" and "Death of Nelson" (frescos of the Houses of Parliament) are noble works. As might be expected, MacLise's works are eminently suitable as subjects for engraving. The three named are among the most popular and successful of the better engravings of our time.

**M'CLURE, SIR ROBERT JOHN LE MESURIER**, the discoverer of the North-west Passage, was born at Wexford, Ireland, 28th January, 1807. He served in the Arctic expedition of 1836, on the Canadian lakes, and on the American and West Indian coasts till 1846, gradually rose to the rank of first-lieutenant (1838), joined Sir James Ross in the search for Sir John Franklin (1848), and on his return was made commander. In 1850 he was nominated to the *Investigator*, and again despatched in search of Franklin. The expedition, entering Behring Strait, reached 117° 10' W. lon., and 73° 10' N. lat., 30 miles from Melville Strait (16th September, 1851), but was there fixed in the ice. A sledge party sighted the North-west Passage on the 22nd October. After a vain attempt to press forward, the *Investigator* sailed round the south end of Banks' Land for 80 miles, and was again checked by ice. In an inlet which they called Mercy Bay, the party were imprisoned till April, 1854, when they were relieved by Captain Kellett, who conveyed them to England. M'Clure was made post-captain, and received a knighthood, while the officers and crew were rewarded by a grant of

£10,000. Subsequently M'Clure served in the East Indies and China, and died at Portsmouth, 18th October, 1878.

**MACON** (the *Matisco* of Julius Cæsar), the capital of the French department of Saône-et-Loire, is situated on the right bank of the Saône, 40 miles north from Lyons, on the Paris-Lyons Railway, and had 17,399 inhabitants in 1886. The town stands on the slope and at the foot of a hill above the Saône, along the bank of which is a noble quay, from which the distant Alps may be seen. The chief public buildings are—the cathedral, old episcopal palace, hôtel de ville; national college, and normal school; the town-hall, which contains a theatre and public library; the general hospital, on the parade; the Church of St. Vincent; and the prison. Among the Roman antiquities are a triumphal arch and the ruins of a temple of Janus. The inhabitants carry on a considerable trade in the wines of the district, corn, cattle, &c. There are manufactures of blankets, leather, earthenware, watches, and jewelry. It was the birthplace of Lamartine.

**MACPHERSON, JAMES**, celebrated for having given to the world the "Ossianic" poems, was born at Ruthven, Inverness, in 1738. He studied at King's College, Aberdeen, and afterwards became parish schoolmaster at Ruthven. In 1758 he published an indifferent poem, entitled the "Highlanders," followed by two others, "Death" and the "Hunter," neither of which possessed any real poetic merit. In 1759 he became tutor to Mr. Graham, the younger, of Balgovan, afterwards Lord Lynedoch, and in the summer of that year, while visiting Moffat with his pupil, he met John Home, the author of "Douglas," to whom he exhibited some "translations" from ancient poems in the Gaelic language. These made a great impression upon Home, who submitted them to the judgment of the literary circles of Edinburgh, and in 1760 they were published under the title of "Fragments of Ancient Poetry collected in the Highlands of Scotland, translated into English," an anonymous preface being contributed by Dr. Blair. These were so much relished in Edinburgh that the Faculty of Advocates raised a subscription to enable Macpherson to make a tour in the Highlands for the purpose of collecting some more of these Celtic remains. During this tour he found, according to his own account, an abundance of Ossianic poetry, not only on the lips and in the memories of the people, but also preserved in ancient MSS.; and in 1762 he published "Fingal," an epic poem in six books, and in 1763 "Temora," an epic poem in eight books, professing to be translations from the Gaelic of Ossian—a Celtic Homer of the fourth century. A storm of controversy soon arose concerning the genuineness of these poems, Dr. Johnson being one of the foremost of those who declared the poems to be forgeries and the composition of Macpherson himself. It is probable that he found in oral tradition the basis of the poems he produced, but in the form in which he presented them they were unquestionably spurious, since the interpolated matter manifestly outweighed and falsified the genuine fragments.

These publications, however, served greatly to advance his own fortune, for in 1764 he was appointed surveyor-general of the Floridas with a salary for life, and in 1779 he became agent to the Nabob of Arcot. He represented Camelford in the House of Commons from 1780 to 1790, and then retired to an estate which he had purchased in his native country. He died on his estate 17th February, 1796, and his body was, in accordance with his own directions, and at the expense of his estate, interred in Westminster Abbey.

**MACQUARIE**, a river of New South Wales, called by the natives *Wambool*, is formed by the junction of the Fish and Campbell rivers, in the counties of Bathurst and Westmoreland, and flows N.W. to 30° 45' S. lat., 145° 20' E. lon., where it loses itself in the Macquarie marshes, from whence issue tributaries of the river Darling. In some

places it is deep, broad, and navigable, in others rapid and obstructed by falls; its total course is about 230 miles.

**MACRAUCHENIA** is a genus of fossil ungulate animals referable to the order Perissodactyla, and nearly allied to the existing horse and rhinoceros. This genus is founded on remains discovered in Miocene or Pleistocene deposits in South America. Macrauchenia was probably as large as a rhinoceros. The feet have three toes. The general form of the skull resembles that of the horse. The dentition is expressed by the formula:—

$$\begin{array}{cccc} I. & 3-8 & 1-1 & 5-5 & 3-3 \\ & 3-3 & 1-1 & 4-4 & 3-3 \end{array} = 46.$$

The incisors, as in the Equidae, have a deep pit in the crown, and the molars resemble in character partly those of the rhinoceros, and partly those of the horse. The vertebrae of the long neck are very similar to those of the Camelidae, and especially of the llamas; as in these, they have no canal for the vertebral artery in their transverse processes.

**MACREADY, WILLIAM CHARLES**, actor and manager, was born in London on 3rd March, 1793. He was intended by his father, a provincial manager, for one of the learned professions, and was educated at Rugby. As in the case of Fanny Kemble, filial duty led Macready to go upon the stage in the hope of diminishing a father's pecuniary embarrassments. His first appearance was as *Romeo* at the Birmingham theatre in the June of 1810. Successful at the outset, after a provincial career of six years, he appeared for the first time before a metropolitan audience at Covent Garden, on the 16th of September, 1816, as *Orestes* in the "Distressed Mother." After eleven more years of labour he had come to be considered the first English tragedian of his age, uniting the fire of the elder Kean to the dignity and good taste of John Kemble, with a refined scholarship especially his own. In October, 1837, he became lessee of Covent Garden, and added to his own noble personations a splendour and accuracy in the *mise-en-scène* till then unknown on the British stage. It was to aid Macready's efforts for the elevation of theatrical entertainments that his friend, Lord Lytton, wrote for him at this period "Richard III." and the "Lady of Lyons;" and as the great French cardinal of the former drama, he achieved one of his most striking histrionic triumphs. His enterprise was not financially successful. At the close of the second season he retired from it, and a testimonial was presented to him in recognition of his efforts. In a similar spirit, and with a similar result, he undertook in 1842 the management of Drury Lane for two seasons. On 26th February, 1851, he took leave of the stage; and the farewell banquet afterwards given to him exhibited the high regard felt for the actor, the manager, and the man. In 1849 he published an edition of the poetical works of Pope, originally prepared and privately printed for the use of his own children, to whom it is inscribed. After his retirement from public life Macready took up his residence first at Sherborne, in Dorsetshire, and subsequently at Cheltenham, where he died, 27th April, 1873. ("Macready's Reminiscences, and Selections from his Diaries and Letters," London, 1875.)

**MACRINUS** (M. Opilius Severus Macrinus), Roman Emperor from 217 to 218, succeeded Caracalla, whom he murdered. He was in his turn murdered by the rebel Elagabalus, after a reign of but fourteen months.

**MACROBIO'TUS**. See WATER-BEAR.

**MACROBIUS** (Ambrosius Aurelius Theodosius Macrobius), author of critical and literary works in Latin, under Honorius and Theodosius, was probably by origin a Greek, as his name (doubtless Makrobios) would imply. His best work is a series of dialogues on the Platonic model, called "Saturnalia." It is in this work that the touching episode of Laberius and Caesar is recounted, referred to in the

article **LATIN LITERATURE**. The best editions are those of Gronovius (Louvain, 1670) and Zeunius (Leipzig, 1774).

**MACROURA** or **MACRURA**, the scientific name for that section of decapod crustaceans which have the abdomen, usually called the tail, long, in contradistinction to that section (*Brachyura*) which have the tail short. Lobsters, crayfishes, shrimps, and prawns belong to this section.

**MAC' TRA** is a genus of molluscs belonging to the siphonate division of the class LAMELLIBRANCHIATA, forming the type of the family Mactridae, or kneading-trough shells. The Mactridae are found in all seas, though they occur in greatest abundance in those of the tropics, to a depth of above 30 fathoms. The species of the genus *Mactra* inhabit sandy coasts, burrowing just beneath the surface, and even leaping like the cockles. They form the food of starfishes and whelks, and in the Isle of Arran are collected to feed pigs. The animal has its mantle partially open, the siphons united and their orifices fringed, and the foot large, tongue-shaped, and beveled. The shell is somewhat triangular and the valves are equal. Of the genus *Mactra* 125 species have been described, world-wide in their distribution. The fossil species are few, dating from the Eocene.

**M'CUL' LOCH, JOHN RAMSAY**, an eminent political economist and statistician, was born 1st March, 1779, at Whithorn, in Wigtonshire. In 1817 he became a contributor to the *Scotsman*, and during 1818 and 1819 acted as editor. From the knowledge of political economy displayed in his writings in this newspaper, and his contributions to the *Edinburgh Review*, he was twice selected to deliver the Ricardo lectures in London, and in 1828 he was appointed professor of political economy in the University of London. In 1838 he received the appointment of controller of the stationery office, a position which he retained until his death, 11th November, 1864. Although he was not an original thinker on political economy, he rendered good service in the work of diffusing just ideas concerning many of the questions which agitated the public mind. He was a voluminous writer, his most important works being the "Dictionary of Commerce" (1834); the "Statistical Account of the British Empire" (1837); and the "Literature of Political Economy" (1845), a very useful contribution to the bibliography and biography of his favourite science. His editions of Smith and Ricardo are also of high value.

**MAD PARLIAMENT, THE**, a nickname given by the king's party to the Parliament which met at Oxford, under Henry III., in 1258, and passed the anti-regal "Provisions of Oxford," inaugurating a committee of reform, and insisting upon a return to the strict observance of MAGNA CARTA. On appeal of both parties to St. Louis of France (Louis IX.) this committee was, however, disbanded.

**MADAGAS' CAR** (called by the natives *Madecasse*), a large island in the Indian Sea, about 240 miles from the coast of Mozambique, on the eastern shores of Africa, extends from 12° to 25° 35' S. lat., and between 43° and 51° E. lon. Its length is 1060 miles; its greatest breadth 350 miles. The area is estimated at about 230,000 square miles, and the population at 2,500,000. The Malagasy are unquestionably a Malay people, following Malay customs, some of them possessing Malay eyes and hair and features, and all of them speaking a Malay tongue. They are divided into numerous tribes, the chief of which are the Hovas, the ruling class; the Betsinisarakas, and the Sakalavas. It is generally believed that there has been an infusion of African blood, more especially among the Sakalava on the north-west coast. Among the inhabitants there is almost every shade of colour, from a very light olive, not darker than may be seen in Southern Europe, down to a very dark tint. Long, black, and straight hair is common

with the lighter coloured tribes, while the darker ones have, as a rule, shorter and more frizzly hair, "although it is rarely, if ever, of the true negro woolly or tufted kind of head cover." In the contours of the face and head there is the same variety, for we meet European types side by side with the high cheek-bones of the Malays, and occasionally even true negro features. The curious tribe of the Kalib or Béhoby, who live in the woods of the Bémarrina, a week's journey to the west of the capital, are said to resemble the Sakalava, jump from tree to tree like monkeys when pursued, are exceedingly timid, and even to have died of fright when captured.

The principal physical feature of Madagascar is the great elevated plateau, which averages between 4000 and 5000 feet above the sea-level. It commences in the northern part of the island, and extends throughout nearly the whole length, but sinks into extensive plains on the south and west. Along the east coast a long chain of lagoons stretches for several hundred miles. They are formed by the sand-bars thrown up by the surf driven by the trade winds, which block the outlets of the rivers. They might easily be made available for transit in that region. The waters, however, abound in crocodiles, and from the ground around emanates the deadly miasma which give rise to the Malagasy fever. From the undulating tract inside the maritime border, the country ascends by successive terraces, the fronts of which form three mountain walls, each supporting a terrace behind it. These are more continuous, better marked throughout, and more difficult of ascent on the east than on the west side. On surmounting the third terrace on the east side, the central plateau is reached at an altitude of 4500 feet. This is named Imerina; it is 160 miles long and 90 broad, and has a central tract of 1250 square miles, richly cultivated, where is the seat of the capital. On the north the plain is bounded by mountains, on the south it opens out into the plain of Betsileo province, where it is 35 to 40 miles wide between the bordering ranges of hills. Here, in 22° S. lat., a lofty ridge crosses from east to west, connecting the two bordering ranges. Beyond this is another plain, with fine bordering ridges east and west, and south of this, as also northwards of the central plain, the country falls away south and north in successive terraces, the lowest being about 800 feet in elevation and 48 miles wide. From the central plain there is a rise of 1500 feet to the base of the mountains, whose greatest altitude is from 8000 to 8950 feet. The loftiest group is that of Ankarat, about 20 miles south-west of the capital, Antanarivo; and these are all volcanic, and cover an area of 600 square miles. Another volcanic centre is seen at their east base, but no craters. The coast-line on the east is comparatively smooth, having only one considerable bay, Antongill, towards the north. The west coast is much more irregular and broken, and has many inlets, harbours, and islands. Owing to the nature of the country the rivers have very rapid courses, broken by falls; and as most of them enter the sea directly without the intervention of bays or gulfs, there are generally bars at their mouths, and hence they are of little use for navigation.

The flora of Madagascar is distinguished by the beauty of the trees and the strangeness of the plants. Except in the more desolate volcanic region the ground is one mass of verdure; bushes and reeds spring out of the tufts of grass, cocoa-nut palms rise to a great height, and the mountains, bathed in blue vapour, combine to make a beautiful picture. Lemon trees, peculiar to the island, offer a welcome shadow from the heat; the Indian acacia showers a profusion of its yellow blossoms; the beautiful lochnera, allied to the periwinkle, throws out its long stems, terminating in a mass of rose-coloured flowers; and the *Palma christi* displays its large leaves—sometimes green and sometimes purple. Near the rivers the eye is enchanted by the

splendid foliage of the ravenna, which sometimes grows to a height of 30 feet, while at the top of the strong stem a gigantic fan spreads out of from fifteen to twenty-five enormous bright leaves. In the larger forests the superb trees, unknown out of Madagascar, towering above all the vegetation around, are the chrysopias. The top is spread out like a parasol, and the branches terminate in bunches of flowers, formed of five petals of dazzling purple, contrasting strikingly with the foliage. Many parts of the island are admirably adapted for the cultivation of sugar and all kinds of tropical fruits, but rice and coffee are the only two articles yet grown to any extent. Among the minerals are iron, tin, silver, copper, plumbago, and potter's clay.

The only indigenous animals of Madagascar are various species of the lemur tribe; the ayo-ayo, which lives on the larvæ hidden in the trunks of trees, and which is supposed to be a link between the squirrel and the monkey; a species of hedgehog, the wild cat, and ichneumon. Cattle and sheep have been introduced with great success, and goats and wild pigs are also common. The birds of the island are numerous, and of brilliant and varied plumage. Lizards and crocodiles are the chief reptiles. All the serpents are inoffensive. The *Apyroris maximus* must have existed in the island at a comparatively recent date, as many of its eggs—which are six times larger than those of the ostrich have been discovered.

The climate of Madagascar is unfavourable to Europeans, but is not so hot as might be expected from its geographical position. The elevated range in the interior, and the wind constantly blowing from the sea, render the heat supportable. Missionary enterprise was formerly often checked by violent means, but Christianity has now almost entirely displaced idolatry, and Christian churches abound.

Madagascar was formerly divided into twenty-eight states, governed by chiefs; but in the present century most of them were subjected to the sway of the Hovas by King Radama, who died in 1828. This extraordinary man, who in energy of character resembled Peter the Great, introduced into his country the arts and civilization of Europe. He received and protected the missionaries, and promoted the establishment of schools, the number of which at the time of his death had increased to more than 100, in which nearly 5000 children were instructed. Several young people were sent to the Mauritius, and even to England, to receive instruction. European mechanics were also well received and employed by Radama. He was succeeded by his queen, who governed on entirely opposite principles—interdicting all trade with foreigners, and persecuting her Christian subjects in a most fearful manner. At the coronation of Ranavato II., however, in 1868, all the symbols of idolatry were excluded and the Bible was placed conspicuously at her right hand. In the following year she was baptized, and all the idols of the nation were by her command committed to the flames. This was followed by the destruction of nearly all the village and private idols.

The capital of the island, Antanarivo, is situated nearly in the centre. The chief port is Tamatave, on the east coast, and much of the trade is carried on through Mauritius.

The government is an absolute monarchy, modified and tempered by customs and usages having the force of law; and during the last quarter of a century the power of the sovereign has been gradually limited and controlled. The sovereign is advised by the prime minister, who is the real source of all political power; he is assisted by a number of ministers, who act as heads of departments—education, justice, the interior, foreign affairs, &c. These swear fidelity to the prime minister as well as to the sovereign. The succession to the crown is hereditary in the royal house, but not necessarily in direct succession; the reigning sovereign may designate his successor. At various periods, 1820, 1861, 1865, and 1868, treaties were concluded with



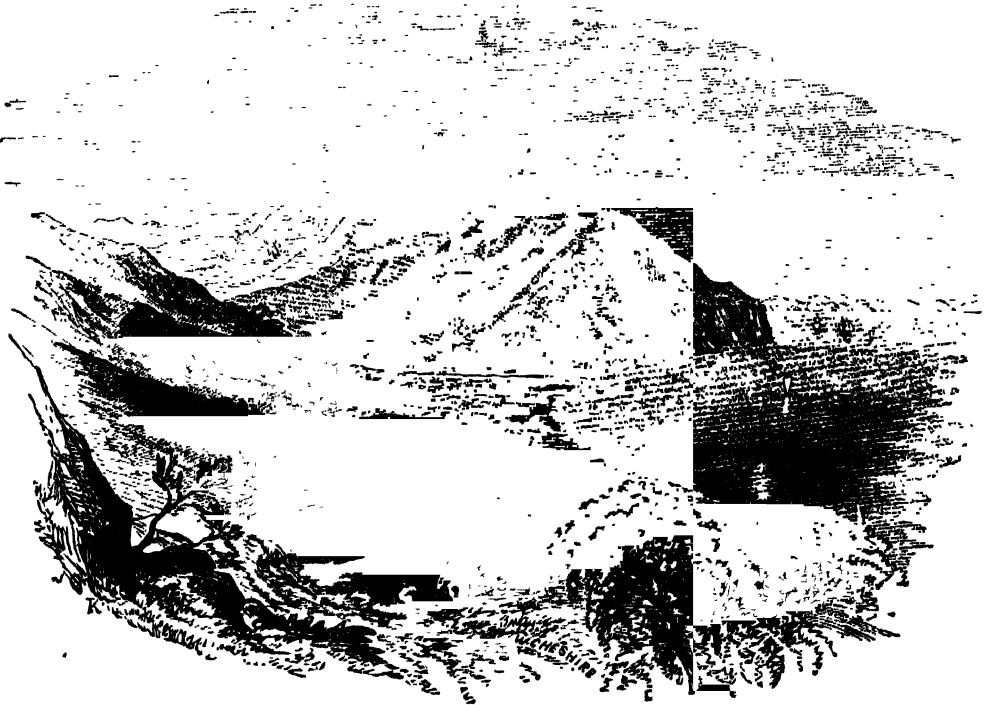
Great Britain, the United States, and France. Under one of these, said to have been made in 1841 with a Sakalava chief, France claimed a protective right over the north of the island from 16° S. lat., which she endeavoured to assert by force in 1883. The port of Tamatave was bombarded by a French fleet, and very strained relations existed for some time between the French admiral and the only representative of Great Britain on the spot, Captain Johnstone of the *Dryad*. An English missionary, the Rev. G. A. Shaw, was seized and confined on board a French vessel on a charge of attempting to poison Frenchmen. The charge proved wholly unfounded, and the French ultimately set Mr. Shaw at liberty and agreed to pay him a pecuniary compensation. Though they had easily seized Tamatave, Majunga, and some other points on the coast, and maintained a blockade, they did not attempt any military operations inland. During this crisis Queen Ranavalona II. died and was succeeded by a great granddaughter of Riahety, sister of King Adrianampoinimerina. After a prolonged blockade, hostilities were ended by a treaty signed at Tamatave in December, 1885, ceding Diego Suarez Bay, to be formed into a French naval station, agreeing to pay £800,000 war indemnity, and giving France the control

of her foreign relations. Tamatave, the capital, was captured by the French in 1887.

("Madagascar: Its History and People," by the Rev. Henry W. Little, London, 1885; "Madagascar and France, with some account of the Island, its People, its Resources, and Development," by George A. Shaw, F.Z.S., London, 1885; "Madagascar: an Historical and Descriptive account of," by Captain S. P. Oliver, London, 1887.)

**MADDER** is the name given to a red dye-stuff, as well as to the plant (*Rubia tinctorum*) which produces it. There is an allied species, *Rubia peregrina*, which is native in England and Ireland, and there are several native species of the allied genus *Galium*, popularly known as "cleavers," "lady's bed-straw," &c. All these plants belong to that section of the order *RUBIACEÆ* the species of which have the leaves in whorls. The colouring matter is contained in the root, which is perennial, and composed of many long succulent fibres, about a quarter of an inch in thickness. The plants are propagated by the numerous shoots.

Madder is indigenous in the south-east of Europe and temperate Western Asia. Pliny mentions that it was cultivated in his time in Italy. It was grown for the sake of the dye in France in the middle ages, according to



Valley of Machico, Madeira.

De Candolle, but the culture fell into disuse, until its revival in the eighteenth century. It is again decreasing, on account of the discovery of a mode of artificially preparing the colouring matter, which is called alizarin. Gerard in his "Herball," in 1597, mentions the medicinal virtues which madder was supposed to possess, though at the present day it is no longer considered effective. Physiologists make use of the fact that the bones of young animals fed on madder become tinted with a red colour, in order to investigate the growth of bone. This property is probably due to the chemical affinity of phosphate of lime for the colouring matter. The stem and leaves are clothed

with stiff hairs, which render them serviceable in polishing metal work.

**MADEIRA**, an island situated in the Atlantic Ocean, between 32° 30' and 32° 53' N. lat., and 16° 40' and 17° 20' W. lon., and nearly 400 miles from the north-western coast of Africa. It is 81 miles long and 12 broad. The area is 370 square miles, and the population 125,000. The island may be almost said to be one vast mass of basaltic lava, trachyte, ashes, tufa, scorie, and pumice, with bombs and lapilli. It rises with a rather steep ascent from the south and from the north towards the interior, where Pico Ruivo, the highest summit, attains to 6100 feet above the



sea-level. Both declivities of the mountain pass are furrowed by deep and generally narrow valleys and depressions, traversed by streams of clear water. The mildness of the climate of Madeira has for many years past caused the island to be very popular as a health resort for invalids. The rainfall is about the same as in the driest counties of England, being no more than 21 inches in the year, a small amount for so low a latitude; the wet days are seventy-three; mean temperature 65° Fahr.; lowest, 53° Fahr.; but under the influence of an east wind called *leste*, the thermometer in the shade sometimes rises to 90° Fahr. This wind is really an African sirocco; but being tempered by the moisture it has absorbed in passing over 400 miles of sea, it is not found injurious to invalids.

From the lowest region of the island to about 750 feet above the sea-level many tropical plants are cultivated. Above this region, to a height of from 750 to 2500 or 2800 feet, the fruits and grain of Europe, especially wheat and maize, are raised; and here are also extensive vineyards, which furnish one of the most important articles of exportation. Then follows a tract covered with high trees, which rises to 8200 feet and higher, where many plants and trees are found which do not occur in Europe; and above this level is a region of grass, fern, and heath. Few horses are kept, and most of them are imported. Cattle are more numerous, and of a large size. Asses are the most common domestic animals, and best adapted to the roads of the country as beasts of burden. Hogs are rather numerous, as well as fowls. In the interior there are many wild swine and rabbits. There are nearly 700 species of coleoptera in all the islands together, and of these 340 are peculiar to the group. Of the 700 there are 200 without wings, though such of them as exist elsewhere are found with wings. It has been suggested that this peculiarity may have been produced by those that had wings being blown into the sea during the violent gales that often occur and drowned; while those fittest to resist this influence survived. Each island of the whole group has a species of spider and a species of helix peculiar to itself. Salted cod constitutes one of the principal articles of import.

The most important article of export is wine. Though the quantity fell off very much after the disease attacked the vines in 1852, the vineyards have been renewed, and the export trade is again steadily increasing. The Madeira, Bual, Sercial, and Malmsey are favourite and well-known varieties. Other articles of export are fruits, honey, wax, orchil, sugar, spirits, and tobacco, besides provisions for calling vessels. The imports consist of manufactured goods, corn, fish (herrings and cod), oil, salt beef, salt, and some tropical productions. In 1874 a fine lazaretto was completed, and supplied a want much felt for many years. FUNCHAL, the capital, has telegraphic communication with Portugal, Brazil, and the Cape Verd Isles.

According to a romantic tale, the leading features of which are historically true, in the reign of Edward III. a young Englishman in the service of the Black Prince, named Markham, fled the country with the fair Anne of Dorset, in order to avoid the anger of her relations. They intended to make their way from the Bristol Channel to the coast of France. But contrary winds drove the vessel far out of its course, and after a long series of tossings to and fro it was cast upon the Madeira shores. Here the lovers are said to have both died, while their companions succeeded in reaching Morocco, and proceeded from thence to Spain. Madeira was rediscovered in 1419 or 1420 by Gonzalves Zarco. It derived its name from the timber (*madeira*) with which it was covered. Soon afterwards it was colonized by the Portuguese, and the culture of sugar and wine was introduced. Sugar was largely grown before the West Indian Islands were colonized.

About 40 miles north-east of Madeira lies the small

island of Porto Santo. It is a basalt rock, which does not exceed 500 feet in height. To the south-east are three small basalt rocks lying in a row from north to south. They are called *Ilhas Desertas*, and are only inhabited by sea-fowl, but they are visited from Madeira for the purpose of collecting the archil with which the greatest part of their surface is covered.

**MADELSTAD**, the name in Picardy, Artois, &c., of the custom known in England as Junior Right, or *Bonouen-Englissh*.

**MADERNO, CARLO**, the architect of the huge and ill-planned façade of St. Peter's at Rome, which so lamentably interferes with the harmony of that superb church, was born near Como in 1556, was appointed architect of the half-finished St. Peter's by Paul V. in 1605, and died at Rome in 1609. Besides perpetrating his façade, Maderno had the audacity to alter the plans of Bramante, Raffaello, and Michelangelo, and extend the west arm of the church, turning it from a Greek (equal-armed) cross into a Latin one, and thus materially injuring the effect of the springing of the grand dome. It is only from a distance, therefore, that the true beauty of St. Peter's becomes manifest.

**MADIA**, the name of a genus of plants belonging to the order COMPOSITE. One species, *Madia sativa*, is much prized. It is a native of Chili, where it is cultivated for the sake of the oil which it yields. It is either put under a press, or boiled under a gentle heat, when the oil is to be taken from it. The oil is used for lubricating fine machinery. There is a single series of involucre bracts, each of which incloses a ray floret; between these and the disk florets there is a row of scales, which do not extend further.

**MADISON**, a city of the United States, the chief town of Wisconsin State, is distant 132 miles north-west of Chicago. It was founded in 1837, and is charmingly situated near the middle of a wide valley, on a high peninsula overlooking the lakes Mendota and Monona; the former of these, on the north of the city, is 6 miles by 4; the latter 5 miles by 2½; the isthmus between them is three-fourths of a mile wide. Both have gravelly shores. The state-house or capital stands in the centre of a square, on ground 20 feet above the lake; from this square the streets part at right angles, descending towards the lake; one only runs obliquely westwards up College Hill, on which stands the university. Rich meadows and fine woods are seen around, and the heights on the sides of the valleys afford beautiful views. The other most important buildings and institutions are the university, post office, lunatic asylum, churches, and a library containing 60,000 volumes. The city is abundantly supplied with railway accommodation, and has manufactures of agricultural implements and woollens, and flour mills. The population in 1880 was 10,324.

**MADISON, JAMES**, fourth President of the United States, was born 16th March, 1751, at King George, near Port Royal, Virginia. He was appointed a member of Congress in March, 1780. He was one of the three commissioners from Virginia who assembled at Annapolis, where he met Alexander Hamilton, with whom he was afterwards so closely united in forming the new constitution, and from whom he was so widely separated in carrying it into execution. His services to the United States cannot be too highly estimated. After the American constitution was formed he was its zealous expounder to the people. He carried it triumphantly through the legislature of Virginia in spite of a strenuous opposition. He was chosen a member of the first Congress in 1789, and continued a member until 1797. In the struggle which succeeded the retirement of General Washington, Madison took an honourable and influential part, and when Mr. Jefferson was elected president he was appointed his secretary of state. He succeeded Mr. Jefferson as presi-

gent in 1809. Under his administration war was declared against Great Britain in 1812 and continued for two years, at a cost to the States of 80,000 lives and 100,000,000 dollars. After serving two terms, Mr. Madison retired to private life in March, 1817. He lived to the age of eighty-one, although he had never enjoyed good health. He died 28th January, 1836.

#### MADNESS. See INSANITY; LUNACY.

**MADO'QUA** (*Neotragus saltiana*) is a remarkably small and slim-built antelope inhabiting the mountainous districts of Abyssinia. The summit of the shoulder is only 14 inches above the level of the ground; but it stands rather higher on the hind quarters. The horns are correspondingly thin, and about 3 inches in length, nearly straight and curved a little forward. The tail is only rudimentary, measuring scarcely more than  $1\frac{1}{2}$  inch from root to tip. The females are hornless. The back is reddish-brown, the sides gray, and the under surface white; the face and legs are red.

**MADRAS', PRESIDENCY OF**, occupies the southern portion of the peninsula of India, with a considerable extension north-eastward along the coast of the Bay of Bengal. It is bounded on the north and north-west by the districts of Kanara and Dharwar of the Bombay Presidency, Hyderabad or the Nizami's Dominions, and the southern native states of Bakhar and Kalahandi of the Central Provinces; on the north-east by the province of Orissa under the Bengal jurisdiction; on the east and south-east by the Bay of Bengal; on the south by the Indian Ocean, and on the west by the Arabian Sea. The eastern portion of the Presidency extends from Cape Comorin, in lat.  $8^{\circ} 4'$ , to the northern extremity of district Ganjam, touching Orissa in lat.  $20^{\circ} 18'$ ; the western portion extends to the coast at the eastern extremity of Mysore native state, in lat.  $13^{\circ} 50'$ —the greatest length from the extremity of Ganjam to Cape Comorin being about 1000 miles, and the greatest width, measured from the coast at the eastern extremity of Mysore to Madras, about 330 miles. The total extent of sea-coast is about 1700 miles, without, however, any single really good harbour. Exclusive of the native states, the area of the Presidency is estimated at 138,318 square miles; including these states it may be taken at 148,063 square miles.

The principal features which give character to the portion of India embraced within the Presidency of Madras, are the two mountain ranges which run through it on the east and on the west, viz. the Eastern and the Western Ghats. The former range runs for some distance almost parallel with the eastern coast, the latter with the western. Starting from the north, the Eastern Ghats, running with the coast to about 50 miles north of Madras, sweep to the south-west and eventually unite, in the vicinity of the Neilgherries, with the Western Ghats, which extend to Cape Comorin on the one side, and to the north-western extremity of the Presidency on the other. These two great ranges may be said to form—one on the south-west, the other on the south-east—the buttresses or walls of the triangular table-land included between them, commonly called the Deccan. Though this table-land rises considerably towards the south, it has a general slope of surface to the east and south-east, as indicated by the large streams flowing in that direction, and emptying themselves into the Bay of Bengal. The low land lying between the base of the Western Ghats and the sea is of less breadth than that lying in the like situation with respect to the Eastern Ghats, being in some places not more than 25, and nowhere more than 50 miles in breadth. Compared with the Western Ghats, the Eastern, south of the Godavari River, are of trifling elevation, the mean height of the chain being about 1500 feet, but attaining a higher elevation as the range approaches southward, near Madras and the junction with the other range in the vicinity of the

Neilgherries. North of the Godavari River the Eastern Ghats rise to an elevation of upwards of 5000 feet, the highest points being Gallikonda, 5346 feet, and Galli Parvatam, 4988 feet. The Western Ghats, on the other hand, rise to over 6000 feet, and at the Neilgherries culminate to 8760 feet. Owing to the superior height of the western range, and its vicinity to the coast, all the head waters of the great rivers of the Presidency originate there, and traverse the Eastern Ghats on their way to the sea.

The principal rivers are the Godavari, the Krishna or Kistna, in their lower courses, the Pennar, Paler, and the Cauvery. Numerous feeders, the chief of which is the Tungabhadra, from the Western Ghats and the plateau of the Deccan, discharge themselves into the Kistna and Pennar. The rivers of the western and southern coasts are numerous, but necessarily short in their courses and unimportant, as are also those in the extreme north-eastern districts of the Presidency.

The coast on the west, called Malabar, from the north-western extremity to Mangalore, is in general bold and rocky; from Mangalore to Cape Comorin, it is considerably lower and either muddy or sandy, having several shallow inlets termed "backwaters," extending in some cases a considerable distance (200 miles) inland, parallel with the coast, more or less navigable, and receiving the drainage of the streams coming from the Western Ghats. Cochin is situated on the principal of these openings. Cape Comorin itself is low and sandy, but a few miles inland, and to the north of the extreme point, the southern summits of the Ghats rise in lofty and majestic peaks known as the Palni Hills. To the north-east of Cape Comorin, the coast, for 166 miles, is low, rocky, and much beset by reefs, and is little frequented, as navigation northwards into the Bay of Bengal is obstructed and rendered impracticable for vessels by a sandbank extending from the mainland of India to Ceylon, called Adam's Bridge, which has only two navigable channels, not however deep enough for the passage of large craft. The sea here, called the Gulf of Manar, has on the coast to the north-west the harbour of Tuticorin. From Adam's Bridge to Point Calymere, on the north of Palk's Strait, the shore has no bold features. From Point Calymere the Coromandel coast commences, and holds a direction due north across the estuaries of the Cauvery, which inclose a delta having a base of 82 miles towards the sea, where are the ports of Negapatam and Tranquebar; the Coromandel coast continues to hold a northerly direction for 297 miles farther to Gondegam, where the river Musi is considered to bound it to the northward, and retains the same character of slight elevation and general sandy formation, with shallow water along-shore. Blackwood Harbour is the only shelter throughout this distance for large ships; at all the other ports along this coast ships must be anchored in the open sea. From Gondegam the shore is termed the Golconda coast, holding a direction north-east for 270 miles to the southern point of district Vizagapatam, and passing the estuaries of the Kistna and Godavari. Here the coast is so low that it is often inundated. Masulipatam, Cocanada, and Coringa are the most important maritime places on this coast, which terminates in lat.  $17^{\circ} 15'$ . The Orissa coast commences at this point; here the coast becomes bold and rocky, and retains this character for about 230 miles to the north-eastern extremity of the Presidency. The eastern coast has a few extensive lakes.

The rivers of Southern India give but little assistance to inland communication, but by means of canals and excellent roads everywhere, this convenience is attained; there are, besides, several lines of railway running through the Presidency. The Madras Railway, 858 miles in length, and the Southern India Railway, 612 miles long, connect Madras with Bombay and the principal towns in the Deccan, as well as with those in the west and south; Madras is

also connected with Mysore and Pondicherry. Steamers also leave Madras regularly for almost every principal port in India.

From the physical features of the country the climate is necessarily very varied. The arid plains of the east coast, with the thermometer occasionally rising to 115° in the shade, form, during a greater portion of the year, a striking contrast to the green valleys of Malabar and Kanara on the west, where the maximum heat is below 90°. The moisture brought up by the south-west monsoon being condensed by the Western Ghats, the average rainfall between that range of hills and the western coast is over 120 inches, most of which falls between the beginning of June and the end of August. A considerable portion of rain finds its way over the Ghats to the central districts, while even those districts on the eastern coast where river irrigation prevails, reap the benefit of this monsoon in the increased volume of water from the slopes of the Western Ghats. The north-east monsoon sets in about the end of September, and during its continuance the average rainfall does not exceed 30 inches. Previous to the rains the country in the eastern and central districts is everywhere parched, and life is endured with difficulty. Along the coasts the sea breezes, which set in shortly after noon almost throughout the year, do much to moderate the temperature. The table-land or undulating surface on the summits of the Neilgherries and Palni, having an elevation of from 5000 to 7000 feet, enjoys the mild climate of the finest part of the temperate zone. The temperature on the Neilgherries varies much less from north to south than from east to west. Mists and heavy fogs are not unfrequent in the rainy season, and the eastern side is less moist than the western. From the end of October to May a sky clear and nearly cloudless is the rule; September and October are pretty irregular in the quantity of rain they bring. The climate is greatly influenced by the monsoons—periodical winds produced by the unequal heating of the continent during certain seasons of the year—the regular alternation of which is remarkable, the transition from one to the other being usually marked by great atmospheric disturbance.

The chief staples of the Presidency are rice, maize, wheat, millet, ragi, and the pulses among food grains; oil-seeds, indigo, tobacco, sugar-cane, chillies, pepper, yams, plantains, and betel-leaf among garden crops, and as a special crop cotton has a large cultivation. The trees most grown for their fruits are cocoa-nut, areca-nut, jack, tamarind, and mango. Cocoa-nut palms flourish most luxuriantly on the banks of the estuaries and back waters of the western districts of Malabar and Kanara. The most valuable product of the Presidency is ship timber, abounding in the forests of Malabar, Kanara, and Travancore, as well as in the forests of the Eastern Ghats, principally teak. Sandal-wood, supplied to the Chinese market, is also obtained from the forests of Malabar and Coorg. Coffee has been very extensively cultivated, and is now an important crop. The principal coffee tracts of Southern India lie along the western coast, and coffee estates extend in nearly an unbroken line along the summits and slopes of the Western Ghats, from the northern limits of Mysore down to Cape Comorin, in the Neilgherries, the Shervaroy and Palni hills, and in several districts of the Presidency. Tea cultivation has not the same interest in Southern India as coffee cultivation, and there are few plantations except on the Neilgherries. Tobacco is grown more or less throughout the Presidency, with the exception of Malabar and the hill ranges, but the chief localities of production are the alluvial lands of the Godavari district, where is grown the well-known Lunka tobacco (so named from the Lunkas or river islands on which it is cultivated), and the Coimbatore and Madura districts. Cinchona (quinine) is also grown on the Neilgherries, and there are now six plantations for the supply of this febrifuge.

The mineral wealth of the Presidency is considerable. Gold is known to exist in the Wynad and Neilgherries, and the attention of capitalists has been lately drawn to these auriferous tracts. Iron ore occurs in several parts in abundance, and extensive foundries have been established in Beypur and South Arcot. Manganese exists in Mysore, the Neilgherries, and Bellary; antimony and silver, copper and lead ore in the districts of Madura, Cuddapah, Kurnool and Nellore, also in Mysore. Diamonds of moderate value and garnets in abundance are met with in the Cuddapah, Kurnool, Godavari, and Vizagapatam districts, and coal is found on the banks of the Godavari, near Chinnore. The usual manufactures are sugar, indigo, pottery, carpets, hardware, cutlery, saddlery, cheroots, working in metals, filigree, and basket work, and the weaving of silk and cotton cloths and coarse woollens.

The administration of the Madras Presidency is vested in a governor with a council of three members. For administrative purposes the Presidency is divided into twenty-one districts, each of which is placed under the charge of a collector and magistrate, all being subject to the direct control of a board of revenue composed of three members. In the district of the Neilgherries the principal administrative officer is termed the Commissioner of the Neilgherries. Each district is again subdivided into *taluks*, the general superintendence of which is distributed among the assistants to the collector, a special local revenue and magisterial head, called a *tahsildar*, being in charge of each taluk, and in larger taluks the tahsildar being aided by one or more deputy-tahsildars and sub-magistrates. The administration of civil and criminal justice is under the superintendence of a high court, assisted by district judges and subordinate judges; the latter are usually natives. The population of Madras at the census of 1881 was 31,281,177.

*History.*—The history of the Madras Presidency forms an integral part of the history of India, and occupies many hundred pages of Mill and Wilson, Elphinstone, Grant Duff, and other standard works.

The Malabar coast, with its wealth of spices and timber, was the cradle of commerce. The "peacocks" of king Solomon have a Tamil name in the original Hebrew; and the word by which rice is known in all European languages has also a Tamil derivation. Syrian Christians and Mohammedans from Arabia have been settled on the western coast of Madras from the earliest times, and their proselytes form a large section of the population of Malabar and Travancore; a colony of Jews, too, have resided in Cochin for many centuries; and the first Portuguese adventurers there found their richest cargoes.

Vasco da Gama, the pioneer of maritime adventure, cast anchor off Calicut on 20th May, 1498. For a century the Portuguese retained in their control the commerce of India, especially along the western coast. The Dutch began to establish themselves on the ruins of the Portuguese at the beginning of the seventeenth century, and were quickly followed by the English, who opened places of business at Calicut and Cranganore as early as 1616. Telicherry, a branch factory from Surat, in 1683 became the principal British emporium on the western coast of Madras, and was permanently obtained by a cession of territory in 1708. The Portuguese eventually retired to Goa, and the Dutch to the Spice Islands. The first English settlement on the eastern coast was founded in 1620 at Masulipatan, even then celebrated for its fabrics. To the south, a factory, the nucleus of the present city of Madras, was erected in 1639, permission having been first obtained from the Hindu Rajah of Chaudragiri. The site of Pondicherry was purchased by the French in 1672. For many years the English and French traders lived peacefully side by side, rivals only in commerce, and with no ambition for territorial aggrandizement. The war of the Austrian Succession in

Europe lit the first flame of hostility on the Coromandel coast. In 1746 the weak garrison of Madras was forced to surrender to Labourdonnais, and Fort St. David remained the only British possession in Southern India. By the peace of Aix-la-Chapelle, Madras was restored to England; but henceforth the national antipathies were destined to run their course. An excuse was found in the disputed successions which always fill a large place in Oriental politics. English influence was generally able to secure the favour of the rulers of the Karnatic and Tanjore, while the French succeeded in placing their own nominees on the throne at Hyderabad. At last, after many vicissitudes and countless intrigues, the great Frenchman, Duplex, rose to be the temporary arbiter of the fate of Southern India. His strength lay in his profound insight into the native temperament and the semi-Oriental magnificence of his ambition. But when his ascendancy was at its height it was suddenly overthrown by the straightforward valour of the yet greater Englishman, Clive, whose defence of Arcot in 1751 forms the turning-point in Indian history. Duplex was shortly afterwards recalled, to be succeeded by Bussy and Lally, who possessed higher military skill, but less political genius, than their predecessor. In 1760 the crowning victory of Wandewash, won by Colonel (afterwards Sir Eyre) Coote over Lally, established for ever the doctrine that one European nation, and that the English, must be supreme in India. In the following year, despite help from Mysore, Pondicherry was captured; and the name of France ceased to awaken disturbing associations in the minds of the natives.

But though the English had no longer any European rival, they had yet to deal with Mohammedan fanaticism and the warlike population of the highlands of Mysore. The dynasty founded by Hyder Ali and terminating in his son Tippoo Sultan, proved itself in four several wars the most formidable antagonist which the English had ever encountered. The Madras government, then at a low ebb of efficiency, was incapable of offering a worthy opposition. On more than one occasion the horsemen of Mysore swept unmolested through the lowlands of the Karnatic, plundering up to the very gates of the English forts. The first war was ended in 1769 by a peace dictated by Hyder Ali beneath the walls of Madras. In the course of a second war, a British force under Colonel Baillie was cut to pieces by Hyder near Conjevaram; and Tippoo fairly drove the English out of Malabar, taking several garrisons prisoner. But the disaster near Conjevaram was avenged in the following year by Sir Eyre Coote, who had been despatched by Warren Hastings from Bengal to take up the command. The victory of Porto Nova, won after a severe struggle, proved that the English were still masters in the open field, though Hyder's superiority in marching power enabled him to escape the worst consequences of defeat. Hyder died in 1782. Two years later, Tippoo consented to sign a treaty which stipulated for the restoration of conquests on either side. This patched-up peace, which left Tippoo in possession of all the means of offence that he had inherited from his father, continued till 1790. The ostensible reason for a renewal of hostilities was Tippoo's cruel devastation of Travancore, but the real cause is to be sought in his inveterate hatred of the English name. Lord Cornwallis, the governor-general, took the field in person. In 1791 the fort of Bangalore was captured by assault, and in the following year Tippoo only saved his capital by consenting to a treaty which deprived him of half his dominions, and exacted an indemnity of more than £3,000,000 sterling. The intrigues of Tippoo with the French republicans led to the fourth and last Mysore War, of 1799, which was ended in a few months by the storming of Seringapatam and the death of the sultan in the breach. Since the beginning of the present century Madras has known no regular war.

MADRAS CITY, the capital of the above Presidency, with its suburbs, extends 8 miles along the coast, and runs  $8\frac{1}{2}$  miles inland, and covers an area of about 27 square miles. In 1881 it had a population of 405,848.

Although at first sight the city presents a disappointing appearance, and possesses not a single handsome street, it has several edifices of architectural pretensions and many pots of historical interest. Seen from the roadstead, the fort, a row of merchants' offices, a few spires and public buildings, are all that strike the eye. The site is so low that it is difficult to realize that behind the first line of buildings lies one of the largest cities in Asia. Roughly speaking, it consists of (1) Black Town, an ill-built, densely populated block, about a mile square, within the old city wall, with more or less crowded suburbs stretching 3 miles north of the Cooum River. This is the business part of the town, and contains the banks, custom-house, High Court, and all the mercantile offices. The latter, for the most part handsome structures, lie along the beach. On the sea face of Black Town are the pier and the new harbour. Immediately south of Black Town there is (2) an open space with a sea frontage of about 2 miles and a depth of three-quarters of a mile, which contains the fort, esplanade, brigade parade ground ("the Island"), Government House, and several handsome public buildings on the sea face. (3) West and south of this lung of the city comes a series of crowded quarters. (4) To the west of Black Town are the quarters chiefly inhabited by Eurasians, and the suburbs, adorned with handsome European mansions, and their spacious "compounds" or parks. (5) South-west and south lie the European quarters of Tanampet and aristocratic Adyar. The city is thus spread over a large area; and it is only after some residence that one realizes the stately semi-suburban life which distinguishes it from the more concentrated social activity of Calcutta. In short, a very large proportion of the tract of country comprised within the municipal limits of the city of Madras—covering as it does an area of 27 square miles, with twenty-three villages—consists of the poor rural district, more or less under cultivation, which surrounds the fort, and the native town and suburban villages now incorporated within its limits. Among the buildings most deserving of notice for their architectural features are the cathedral, Scotch kirk, Government House, Patcheappah's Hall, senate house, Chepak Palace (Revenue Board), college, and Central Railway Station.

As the seat of the Madras government, and the headquarters of the Madras army, nearly all the most important offices of the Presidency, and the headquarters of every department, are located in the city.

Notwithstanding its exposed situation, Madras ranks third among the ports in India, in respect of the number and tonnage of vessels calling and the value of its imports and exports. The port trades with every part of the world, exporting coffee, cotton, grain, hides, indigo, oil-seeds, dye-stuffs, sugar, and horns; and importing piece-goods, iron and other metals, and all kinds of European manufactures. The landing and shipping of goods is effected partly by lighters to the pier-head and partly by the old *masula* boats. The pier, which is 1100 feet long by 40 feet wide, was commenced in 1859 and completed in 1862 at a cost of £110,000; and although but a poor substitute for a harbour it was found very useful. An inclosed harbour has recently been constructed, which consists of two projecting masonry piers, crossed by similar piers parallel to the shore. The space inclosed is about 200 acres, and accommodates from thirteen to forty ships of large draught, besides small vessels. The roadstead of Madras, like the whole line of the western coast, is liable to be swept by hurricanes of irresistible fury, which occur at irregular intervals of years, generally at the beginning of the monsoons in May and October.

The trade of the town does not depend on any special local manufactures or produce. Such industries as once flourished—weaving, for instance—have decayed, and no others have grown up to replace them.

Madras is not ordinarily an unhealthy town, either for natives or Europeans. Its sea-breeze and dry soil appear to more than compensate for the lowness of the site. The temperature is high all the year round, but there are fewer sudden alternations of heat and cold than in most places in India. The mean temperature in the shade ranges between 74° and 87° Fahr., the extremes being 67° in January and 93° in June. The death-rate averages thirty-three per thousand per annum. It usually increases during the cold and rainy season, and is at its minimum during the dry hot months of April, May, and June. The population is liable to periodical visitations of cholera and small-pox. The land rises slightly as the distance from the sea increases, but in no part of the municipal limits is the elevation more than 24 feet above the sea, while in many thickly populated neighbourhoods the levels are so low as to offer serious obstacles to drainage. The average rainfall over the town area is nearly 48 inches in the year. The chief outlets for the discharge of excessive rainfall are the Cooum River, the main drain of Black Town, and two minor channels between the Cooum and Saint Thomé. The heaviest rainfall usually occurs during the north-east monsoon, as much as 18 inches having been known to fall within twenty-four hours. The locality of the town is liable to prolonged periods of drought, as well as to heavy floods.

The derivation of the name of Madras is doubtful. *Mandaraj* or *Mandala Raj*, both words implying government, and *Madrasai*, a Mohammedan school, have been suggested as the etymology; Dr. Burnell favours the latter. The native name is Chennapatnam, or the city of Chennappa, the brother of the local chief or *naik* at the time of its foundation. The name Madraspatnam seems to have been in use almost from the same date.

#### MAD'REPORE. See CORAL.

**MADRID**, the capital of New Castile and of Spain, and now also of the province of Madrid, is situated on a bare and exposed plateau, 2060 feet above the sea-level, in the middle of the extensive plain of New Castile, which is bounded on the north by the mountains of Guadarrama, and on the south by those of Toledo. Madrid is supposed to occupy the site of the *Mantua Carpetanorum* of the Romans. It was a frontier town in the time of the Moors, and was constituted the capital of Spain by Philip II. The city is of a quadrangular form, nearly 2 miles long from north to south, and nearly a mile and a quarter in breadth, and is surrounded by a wall 20 feet high, entered by sixteen gates. One of these, the Alcala Gate, near the middle of the east wall, is very fine; it is a triumphal arch, 72 feet in height, and has five arched roadways; the Toledo Gate on the south, and the Vicente Gate on the north-west, have less merit. Occupying an area about 5 miles in circumference, and with a population at the last census of 397,816, it stands on the left or eastern bank of the Manzanares, a small river, which is crossed by two majestic bridges, called Puente de Toledo and Puente de Segovia.

The general aspect of Madrid from all the approaches is anything but inviting. The sterility of the neighbourhood is depressing in its glaring nakedness. Throughout the greater part of the year the city is insufferably hot and dusty, while even in the height of summer it is subject to the descent of bitter winds from the Guadarrama. Since the revolution of 1868 many works have been carried out to render the capital more convenient and healthy, and there is now railway and tramway connection in all directions; the line from Santander enters on the north-west side of the city, under the low hill called Montana del Principe Pio; but there is very little trade, except of a local nature, and the rivers, including the Tagus, 26 miles

distant, are not navigable. Numerous dungeon-like *convents* have been cleared away, and there are wide and well-paved streets, well-planted promenades, fountains in many of the squares, gorgeous churches, and handsome public buildings. The houses are large and well constructed. There are over seventy-two squares and open spaces, of which the principal are—that of the Royal Palace; that of Santa Catalina, where a beautiful bronze statue of Cervantes has been placed; the Puerta del Sol, where the five principal streets of Madrid meet; the Plaza de la Cevada, where criminals were formerly executed; and lastly, the Plaza Mayor, which is the finest of all.

The royal palace (*Palacio Real*), though unfinished, is one of the finest royal residences in Europe. The interior is decorated in a style of costly magnificence. It has four fronts, 470 feet in length and 100 feet high. The custom house; the Casa de Correos (post office), in the Puerta del Sol; the palace called de Buena Vista, formerly belonging to the dukes of Alba, now converted into an artillery museum; the royal printing office, in the street of Carretas; and the palace of the Duke of Berwick—are among the public and private buildings which adorn the capital. Among the numerous churches and convents which fill the streets of Madrid very few can be mentioned as a specimen of a pure style of architecture. The public promenades are many; the chief are the Prado, the Retiro, and the Delicias.

Madrid is the see of a bishop, and has as its cathedral the church of Santa Maria de la Almudena, erected before the institution of the see. There is a university, and schools of medicine and veterinary surgery, military and engineering schools, a normal school, schools of trade, arts, and music, a national library of above 200,000 volumes and valuable MSS., museum, observatory, and botanic garden, and a magnificent collection of armour of all ages near the western palace, the finest of the kind in Europe. There are many large convents, hospitals, a workhouse, educational hospitals for soldiers' children, and other benevolent institutions; a mint, palaces of the Cortes or Houses of Parliament, many private palaces of the Spanish magnates, some with fine picture galleries and armouries, botanic gardens, and numerous theatres and opera houses.

The *museo* or picture gallery, one of the finest in the world, is open to the public on Sundays and Mondays, and to foreigners on other days on producing their passports. It contains upwards of 2000 pictures, among which are sixty-two by Velasquez, forty-six by Murillo, ten by Raphael, and a proportionate number by other great masters.

Madrid has little manufacturing industry. A manufactory of porcelain and another of tapestry are both the property of the government. There is also a government tobacco manufactory, at which serious riots took place in 1885 in consequence of the introduction of machinery. The climate is of the excessive type, the cold of winter and spring being very intense, and the summer heat very great. This is owing to the elevation, the unsheltered situation, and the proximity of the lofty snow-clad sierras. Even in summer the changes of temperature are very sudden and dangerous, especially with a north-east wind. The temperature often falls below zero. Mean of January, 48·7° Fahr.; of July, 87·51° Fahr. The village of the Escorial, with its celebrated palace, is 26 miles distant north-west. The city is well supplied with good water from two sources, one 32 miles distant, in the Sierra Guadarrama, to the north, and another from a spring to the north-west, whence it is raised by machinery into reservoirs.

**MAD'RIGAL**, a certain fanciful style of poetry, such as the Elizabethans would call a "conceit," built up on some word play or motto, somewhat as the *ballades* of old France. The word has given rise to many conjectures as to its meaning; some saying it is *Madre gala*, honour to the (Virgin) Mother, though most madrigals are amatory or

witty poems; others saying it is *mandra gale* (Lat. *gale* = *cat's*, a mere suffix), *mandra* meaning a herd, so that a madrigal or madrigal is a herdsman's ditty—but unfortunately no pastoral madrigals exist! The fact is that the madrigal is the Spanish version of the old Oriental proverbial songs, the *madre güña*, mother-wit, being the very appropriate Spanish name. One of the great writers of madregañas was a certain Don Jorge de Madrigal, Madrigal being a village in Spain, and the madregaña was called madrigal by the Northerners (Flemings and English) in a certain confusion between poet and poetry, and hence also madrigale by the Italians.

There were very usually three stanzas to a madrigal, and each one wove in the motto or proverb, the whole (like the sonnet) inclosing one simple master-idea. When the Netherlanders began to write madrigals and set them to music, it was but natural that the short lines of the poems, the repetition of the motto, and the answering of one stanza by another should fall in most admirably with the imitative and contrapuntal style of the early mediæval music. It is evident that each recurring enunciation of the "motto" should bear the same melody, and further that the whole poem being based upon the expression of one thought, or of few thoughts, the music ought to be constructed upon one melody or upon a few associated melodies. Hence arises the well-known conversational arrangement in short phrases so typical of madrigalian music, one phrase being "answered" in technical musical manner by its counterpart. Petrarcha and Tasso have left the finest Italian madrigals, apart from musical treatment, and there are many very fine ones among early Spanish poetry.

MADRIGAL, in music, is an unaccompanied vocal composition for a choir, sometimes in three parts, but commonly in more. The Flemings invented the madrigal about the middle of the sixteenth century, and the Italians took it up shortly after. Palestrina, Marenzio, Mazocchi, Festa, Gastoldi, and Scarla, in Italy, and Morley, Weelkes, Wilbye, Bennet, John Ward, Orlando Gibbons, Dowland, and Ford, in England, were the chief madrigal writers of that and the next century. It is not too much to say that the English madrigalists have no superiors. The art was long indebted to the Madrigal Society, a club which consisted chiefly of amateurs, founded in London in 1741, and which, by zeal and perseverance, succeeded in diffusing throughout the British Isles a taste for a species of music as delightful as it is scientific. The contrapuntal nature of the madrigal, the complete equality of interest in the parts, and the unlimited number of performers who may take part in it, are the chief points of difference from the later form of the "glee." The severe simplicity of the madrigal, its purity of effect, as it is always unaccompanied, and may be sung therefore in just (untempered) intonation, place it at the head of concerted vocal music.

**MADURA**, an island in the Eastern seas, separated by a narrow strait from the north-east coast of Java, with which it is connected under the Netherlands government. Lat. 70° S., lon. 113° E. Its extreme length from east to west is 90 miles, and its mean breadth 17 miles. The inhabitants, who reside chiefly in villages, amount to about 670,000. The religion of the Madurese is Mohammedan, although the remains of Hindu temples attest the prevalence of that faith in former times. The natives are active, honest, brave, and skilful.

The island is inferior in fertility to Java, and barely supports its population; but in parts the soil is rich, and rice grows abundantly. Buffaloes and sheep are reared in great numbers. The chief export is salt.

**MEANDER**, the modern Buyak Meinder, a river of Asia Minor, which flows for 250 miles through wild mountain gorges and rich alluvial plains to the Ægean near Miletus, and whose remarkable windings have given rise to the English word "meander."

**MÆCENAS**, **CAIUS CILNIUS**, belonged to the equestrian order, and was descended from an ancient Etruscan family at Arretinum. He early became acquainted with Octavianus (Augustus Cæsar), and continued through his life an intimate friend and chief adviser of that emperor. While Augustus was engaged in opposing Sextus Pompeius, and also during many of his other wars, Mæcenas was intrusted with the charge of the city. Mæcenas is said to have dissuaded Augustus from his purpose of restoring the ancient Roman constitution, which Augustus, however, probably never seriously intended. He was born about B.C. 70, and died B.C. 8.

Mæcenas was a great patron of literature; and it was principally owing to his assistance and support that Virgil and Horace were raised from indigence, and enabled to devote themselves to poetry. They were both admitted to his friendship, and Horace in particular lived in terms of intimacy with him. He was a man of luxurious habits, and lived in a magnificent house on the Esquiline Hill. He amassed a very large fortune, which he used liberally, and which he bequeathed to the emperor at his death. It was from the tower of the house that Mæcenas built that, later on, Nero beheld the burning of Rome. Mæcenas wrote several works, such as poems, tragedies, and a "History of the Wars of Augustus."

**MAELAR**, an extensive lake of Sweden, running inland for about 80 miles from the Baltic, with a breadth varying from 2 to 23 miles. It contains no less than 1300 islands, and its total area is 520 square miles. It has deep and clear water, and is connected with the Baltic by a strait, on both sides of which Stockholm is built. The river Arboga and a canal connect it with Lake Hjälmnar. When the Baltic rises much above its ordinary level the sea-water flows in, and the lake becomes brackish. It gradually becomes fresh again; and in this way its bottom may present alternating marine and fresh-water deposits, with fossils, after the manner of the tertiary basin of Paris.

**MAELSTROM** or **MALSTROM** (Danish, *malström*, a whirlpool), a celebrated whirlpool off the north-west coast of Norway, and immediately to the south-west of Moskenesøe, the most southern of the Lofoden Isles. It is in reality a violent current, which runs in opposite directions alternately for six hours at a time, and with a peculiar rotatory motion. Notwithstanding the fables told of its dangerous character, it may be traversed with safety by ordinary sailing boats, except when a north-west wind beats up against the reflux of the waves. Its depth does not exceed 20 fathoms.

**MAELZEL**, **JOHANN NEPOMUK**, inventor of the well-known and highly valuable musical appliance called the METRONOME, was the son of an organ-builder of Ratibon. He was born in 1772, visited many countries, but not England, and died on shipboard in the American seas, 1838. He was a most ingenious man, but overshrewd. His relations with Beethoven are not to his honour. Beethoven wrote for him the fine piece "Battle of Vittoria," for a large automatic musical machine to represent an orchestra, in gratitude at a slight relief he had experienced from an ear-trumpet invented by Maelzel; but Maelzel behaved so badly with regard to claiming the copyright, and even (as he asserted) the *musical design* of this valuable piece, which he had induced Beethoven to score for an orchestra, that the composer even had to take legal proceedings against him. Beethoven's authoritative commendation of the metronome in 1817 at once brought it into universal favour, and it is a proof of the excellent nature of that great man that he not only stated this in the fullest manner, but withdrew his lawsuit in order not to prejudice Maelzel. (The costs were equally divided.) At one time Maelzel possessed the famous automaton chess player; he sold it to Eugène Beaularnais, stepson of Napoleon I. He invented many ingenious musical and other appliances. The main

idea of the metronome—the use of a variable pendulum to measure musical time—was not due to Maelzel, but was obtained by him, in the course of his many travels with his musical automata, from a Dutch artisan named Winckel. Maelzel, in fact, was exceedingly acute and inventive, but not truly original.

**ME'NADS**, another name for the half-maddened female worshippers of Dionysos (Bacchus), better known to us as **BACCHANTES**. The name comes from Gr. *mainomai*, to be mad. The term is often used as an epithet for an amazonian fury by modern writers: a splendid example is that in Carlyle's "French Revolution," vol. i., "Insurrection of Women."

**MÆSA, JULIA**, one of the cleverest of the Roman empresses, was the sister of the noble Julia Domna, wife of the Emperor Severus, and mother of the tyrant Caracalla. Julia Mæsa had two daughters, each of whom had a son; and when her nephew Caracalla had met the fatal reward of his crimes (A.D. 217) Julia Mæsa spent her vast fortune in preparing the elevation of her grandsons to empire. Eventually **ELAGABALUS**, the elder of them, was by her astuteness enabled to overthrow the usurper Macrinus (218), and when she found that his dissolute character had disgusted the Roman people, Alexander Severus [see **SEVERUS**], the younger of them, was raised by her arts to the purple (211). Julia Mæsa shared largely in the public acts of empire, very unusual for a woman, and after her death formally prohibited. She died about 225.

**MAES'TRICHT** or **MAASTRICHT**, a town of the Netherlands, the capital of the province of Limburg, formerly considered one of the strongest places in Europe, but dismantled in 1878. It is situated on the left bank of the Maas, 110 miles south-east of Amsterdam; opposite to it is its suburb of Wyck. The town is now a place of great commercial activity, and has famous earthenware and glass works, and manufactures of leather, paper, woollens, cottons, arms, tobacco, and beer. Its chief buildings are its town house, its churches, and it has numerous hospitals and charitable institutions. Population, 29,000. Maastricht is the *Trajectum Superius* of the Romans. It was besieged by the Spaniards, under the Duke of Parma, during four months, in 1579, and its surrender was followed by a terrible massacre of the citizens. The fortress has sustained numerous other sieges, of which the three most memorable terminated with its capitulation, viz. that of 1632 by Prince Frederick Henry of Orange, that of 1673 by Louis XIV., and that of 1748 by the French under Marshal Saxe. Maastricht was almost the only town in the south part of the Netherlands which was successfully maintained by the Dutch against the Belgian insurgents after the eventful month of September, 1830. A hill 3 miles distant, called Petersberg, has most extensive excavations, supposed to have been made by the Romans to obtain stone. In these there are 16,000 passages 12 feet wide, and 20 to 50 feet high, and covering a space of 12 miles by 6.

**MAES'TRICHT CHALK** is a calcareous formation that occurs at Maastricht, on the Maas. It is about 100 feet thick, and rests unconformably on the chalk. It is interesting as containing an admixture of cretaceous and tertiary fossil forms, which show it to be of intermediate age. It contains the aberrant cephalopods *Baculites* and *Hamites*, which are peculiar to the cretaceous, but with these occur *Volutes*, typically representing tertiary gasteropod life.

**MAGAL'HAENS, STRAIT OF**, commonly called the *Strait of Magellan*, is the most extensive strait known on the surface of the globe. Its length in a straight line is above 200 miles; but if the three great bends are taken into the account, it is rather more than 300 miles. It divides the continent of South America from Tierra del Fuego. The eastern entrance is formed by Cape de las Virgenes on the continent and by Cape del Espiritu Santo, or Queen Catherine's Foreland, which is on King Charles'

Southland, the largest of the islands composing Tierra del Fuego. At its western entrance are Cape Pillar to the south, on the island of South Desolation, and Cape Victory to the north, on a small island belonging to Queen Adelaide's Archipelago. The most northern bend of the strait approaches 53° 10' S. lat., and the most southern inlet, called Admiralty Sound, 55° S. lat. The eastern extremity of the strait is situated in about 68° 20' W. lon., and the western in about 74° 40'.

The Strait of Magalhaens was discovered by Fernando Magalhaens in 1520. It was formerly much navigated by vessels bound for the harbours on the western coast of America; but the navigation was always dangerous and tedious, in consequence of the all but continuous western gales, the great strength and irregularity of the currents, the numerous rocks and cliffs in the western part of the strait, and the great humidity of the climate, which engenders scurvy and other diseases. At present a vessel rarely enters the strait unless despatched by some government for a special purpose.

**MAGAZINE** (Arabic *malh-an*), a strong building, constructed generally of brick or stone within a fortified place, or in the neighbourhood of a military or naval station, in order to contain in security the gunpowder or other warlike stores which may be necessary for the defence of the place, or for the use of the troops who are to perform military duty in the province or district.

The buildings in which gunpowder is contained are constructed with every precaution necessary to insure dryness. They are generally in places remote from other buildings; they are furnished with metallic conductors, in order to avert danger from lightning; and for security against the attempts of ill-disposed persons they are surrounded by a wall and ditch. When in situations where they may become the objects of hostile measures, they are made shell-proof. They should always be built to admit sufficient daylight to render the use of lanterns unnecessary.

The great magazines which have been constructed in this country consist of several parallel vaults, separated from each other by brick partition walls, in which are doorways for affording lateral communication. Each vault is about 90 feet long, 19 feet wide internally, and from the floor to the crown of the arch 19 feet high. The side walls are from 8 to 10 feet thick, and are strengthened by buttresses built at intervals against them. The concave or interior surface of each vault, in a vertical and transverse section, is nearly of a parabolical figure, above the springing courses; and the exterior surface has the form of two inclined planes meeting in a longitudinal ridge line above the middle of the vault. One of the vaults is usually kept empty, so that the gunpowder may be moved from one place to another, a process necessary to keep it in good condition. The thickness of the brickwork forming the vaulted roof is therefore various: at the crown it is 7 or 8 feet, and on the haunches about 3 feet, this being considered sufficient to resist the shock of falling shells. Temporary magazines, such as are formed to supply the batteries in a siege, are generally made of wood covered with earth.

On board a man-of-war the magazine is of great strength. It is situated in the hold, and is separated by a transparent screen from the light room, in which lanterns of a special kind are kept to light the magazine—the introduction of fire in any form into the magazine itself being absolutely forbidden. In case of a fire near it, it can be immediately flooded.

**MAGAZINE** (in literature). See **NEWSPAPER**.

**MAG'DALA**, a town and hill fortress of Abyssinia, situated on the Talanta plateau, an elevation about 9000 feet above the sea, and considered by the Abyssinians to be impregnable. It is 120 miles south-east of Gondar, and is worthy of notice as having been the chief stronghold of the late Emperor Theodore, and the place in which



he kept the English prisoners confined for a long period. It was stormed and taken by the British army on 14th April, 1868.

**MAGDALEN COLLEGE, OXFORD** (always pronounced *Maud'lin*), was founded in 1458 by William of Waynflete, bishop of Winchester and lord high chancellor of England, for a president, forty fellows, thirty scholars called *demies*, a schoolmaster, an usher, four chaplains, an organist, eight clerks, and sixteen choristers. By an ordinance framed for the college under powers granted by the Act 17 & 18 Vict. c. 81, the statutable restriction of fellowships to certain counties and dioceses was abolished, and ten fellowships were suspended, and ten demys added to the statutable number. Demys are now open, and without reference to place of birth, for five years. There are twenty exhibitions for deserving persons in need of support at the university; and four professorships (called Waynflete Professorships) were founded and maintained within the college in lieu of the lectureships mentioned in the previous statutes. The visitor is the Bishop of Winchester. The tyrannical conduct of James II. in forcing a Catholic president (a man of infamous life moreover), and twelve Catholic fellows on Magdalen in 1687, was one of the most unpopular of the acts which led to his overthrow and the fall of the Stuart dynasty. The whole of the university at once became rebels in their hearts.

Magdalen College stands upon a plot of ground at the entrance of Oxford from London, bounded on its east side by the Cherwell, beyond which extends a fine deer park. The buildings are extensive and finely designed. The cloisters are particularly fine. The entrance-court leads into a larger quadrangle, which contains the chapel, hall, and library. South of the chapel, and on the south side of what is called the chaplain's court, stands the tower of the college, the beautiful proportions of which render it one of the chief ornaments of Oxford. The great quadrangle was begun by the founder in 1473, though not finished till after his death. The foundations of what are called the new buildings of this college, unfortunately in most unhappy contrast with the exquisite architecture of the fifteenth and sixteenth centuries, on the north side of the great quadrangle, were laid in 1833. The chapel, which had been refitted and decorated in an incongruous manner in the time of Charles I., was restored to its former magnificence in 1833. In 1872 various improvements were made in the college, and a fine class-room, &c., added, and in 1885 were finished a noble set of buildings extending along the High Street of Oxford, in the original style of the architecture of the college, and forming, therefore, a beautiful mass with the tower which rises at the end of them. These buildings cost the college at the rate of £1000 for each set of rooms, owing to the intricacy of the carvings, &c., required.

**MAGDALEN HALL, OXFORD.** The school, with the refectory and chambers erected by Bishop Waynflete for students previous to admission into his college, and adjoining its buildings, obtained the appellation of St. Mary Magdalen Hall as early as 1448, and was governed by one of the fellows till 1602, when it became an independent hall. The president and fellows of Magdalen College, being desirous of recovering this site, obtained in 1816 an Act of Parliament which authorized them to prepare Hertford College, which had lapsed to the crown, for the reception of this society, and the principal and other members removed there on its completion in 1822. An Act of Parliament was passed in 1875 making certain changes in the constitution of the Hall, which is now known as Hertford College.

**MAG'DALEN, MARY**, that is, Mary of Magdala (a village on the shores of Galilee). The name seems to have been given by the evangelists to distinguish the bearer from the other Marias mentioned in the Gospels. She is

first mentioned in Luke viii. 2, as being among the women who followed Jesus and ministered to him of their substance, and we learn from the same passage that seven devils had been cast out of her. Her life of ministration seems to have brought her into close companionship with Mary, the mother of Jesus, and Salome, the mother of James and John, and at the time of the crucifixion she stood with the women "afar off, beholding these things" (Luke xxiii. 49). She was also the first at the sepulchre on the morning of the resurrection, and the first to see Jesus after that event (Mark xvi. 9-11). At an early period, by an altogether unsupported assumption, Mary Magdalen was identified by Christian writers with the woman of unchaste life who anointed the feet of Jesus, as recorded in Luke vii. 37-50, and it is in this character she is always represented in art. It is in consequence of this theory that the term Magdalene or Magdalen has come to be applied to women who have fallen from chastity, as we see in the name *Magdalene Asylums* given to the refuges erected by Christian charity for such unfortunates.

**MAGDALENE COLLEGE, CAMBRIDGE** (pronounced *Maud'lin*), was built by Edward Stafford, duke of Buckingham, in the year 1519, under the name of Buckingham House, on the site of an ancient hostel belonging to the abbey of Ely, Ramsey, and Walden. The duke not having completed the building at the time of his attainder, the college fell to the crown, and was granted to Thomas, Lord Audley, lord high chancellor of England. Formerly there were four fellowships on the foundation of the college and fourteen by-fellowships; but by the new statutes the by-fellowships were abolished, and there are eight open fellowships. It is also declared by the new statutes that (excepting those scholarships and exhibitions the right of preference to which is preserved to particular schools) the total amount of such scholarships and exhibitions forms a general fund for open scholarships. At present these alterations have permitted three open scholarships of £60, three of £10, and six of £20 a year each.

This college, which stands on the north side of the Cam, consists of two small courts. On the north side of the second is a stone building, the body of which is appropriated to the reception of the Pepysian Library. This library was bequeathed to the college by the well known "diarist" Samuel Pepys, secretary of the admiralty in the reigns of King Charles II. and King James II., the original of whose famous and priceless diary is one of its chief treasures. See *PEPYS*.

**MAG'DEBURG**, a town of Germany, and the capital of the government of the same name and of the province of Prussian Saxony, and one of the strongest fortresses in Prussia, stands on the left bank of the Elbe and on an island formed by its arms, 80 miles south-west from Berlin. The town consists of three parts, called Altstadt, Neumarkt, and Friedrichs-stadt; and of two suburbs, Sudenburg and Neustadt. It is ill built, with narrow, crooked streets. The most remarkable buildings are—the noble cathedral, which was completed in 1363, the town-hall, the government house, the artillery barracks, and the theatre. Of the squares the largest are the old market-place, in which is a statue of Otto the Great; and the cathedral square, which is surrounded by handsome buildings and avenues of trees. It has numerous charitable, literary, and scientific institutions, schools, gymnasia, libraries, and picture galleries; and manufactures of silk, broad cloth, leather, gloves, lace, tobacco, jewelry, pottery, beer, spirits, &c. There is also an active trade, facilitated by railways to Berlin, Hamburg, and Dresden, and by steam on the Elbe. Magdeburg is very ancient, dating from the eighth century, and is rich in historical associations; it is the see of a bishop, was at one time a member of the Hanseatic League, and long the capital of an archbishopric, which was secularized at the peace of Westphalia. It suffered



during the religious wars of the sixteenth and seventeenth centuries, being sacked and nearly destroyed in 1631. It had sustained a siege of twenty-eight weeks against the imperialists, under Tilly; and when it was at last taken, 30,000 of the inhabitants were butchered. The French took it in 1806, and annexed it to the then kingdom of Westphalia, but it was restored to Prussia in 1814. The population of the city and suburbs in 1881 was 137,109.

**MAGDEBURG CENTURIES** was the name given to an ecclesiastical history published at Basel (1559-72), because the work was begun at Magdeburg by Matthias Flacius (1552), and was divided into centuries, each of which occupied a volume. The design of the originator of the work was to demonstrate the identity of the principles of Protestantism with the doctrines of the primitive church, and to show how, from time to time, novelties and innovations had been introduced by the papacy. In this undertaking he was assisted by J. Wigand, Matthew Judex, B. Faber, A. Corvinus, T. Hothhus, and others, and the expense of publication was defrayed by several Protestant princes and noblemen. The writers, who received the name of *Magdeburg Centuriators*, accomplished their task with much learning, earnest research, and temperate judgment; but the work was only brought down to the year 1300, and as a volume was devoted to each century it just extended to thirteen folio volumes. It was not allowed to pass unchallenged by the historians of the Roman Catholic Church, and the "Annales Ecclesiastici," in twelve vols. folio, were written by Baronius in reply (Rome, 1588-1607).

**MAGDEBURG HEMISPHERES.** It is of course as difficult for anyone to realize the enormous weight of the superincumbent mass of the air-ocean in which we live as it would be to make a fish sensible of the weight of water. Therefore any appliances which make this weight visible by its effects are very welcome. Otto von Guericke, burgomaster of Magdeburg, an ardent student of natural philosophy, hit upon the idea of pumping air out of inclosed spaces, just as one would pump water; and the AIR-PUMP was invented by him about 1650. Among the best of the various instruments he invented to show the powers of the air-pump is that of the hollow divided sphere, called after him the Magdeburg Hemispheres; for these not only show the crushing weight of the atmosphere, but also that it obeys the laws of other fluids and distributes this enormous pressure equally in *all* directions, though it arises in the vertical direction only. The Magdeburg hemispheres are usually of brass, and about 4 inches in diameter, fitting well by the edges, which are somewhat broadened and well greased. The lower hemisphere has a stopcock on a tube, so that the air-space formed by the two when put together may be exhausted of its air by an air-pump. The cock is then turned off, the air-pump detached, and the apparatus may be carried by a ring attached to the other hemisphere. The hemispheres thus treated will not fall apart, no matter in what position they are held, and thus give an elegant proof that the elastic force of the atmosphere presses them on all sides. It requires indeed a very strong pull, if they are well made, to get them asunder, for the pressure is considerably over a hundredweight; though if the stopcock be opened and the air admitted they fall asunder instantly.

**MAGEL'LAN, STRAIT OF.** See MAGALHAENS, STRAIT OF.

**MAGELLAN'IC CLOUDS**, the name given by sailors to two cloudy oval masses of light, to the naked eye very like portions of the Milky Way, with which they are, however, unconnected. Sometimes sailors also call them familiarly the "coal-bags." The astronomical name is Nubeculae. They are named *Nubecula major* and *minor*, and are situated in the southern hemisphere. *Nubecula major* will be found in our PLATE CONSTELLATIONS (Southern Hemisphere), near the Antarctic Pole, and close to the constellation Dorado. This is mentioned by the Arabian astronomer

Abdurrahman Sufi in A.D. 900; was observed by Pinzon in 1493, and Anghiera, 1610. When telescopically investigated the Magellanic Clouds are found to be markedly different from the Milky Way; for whereas the latter is made up almost purely of stars, the former contain great numbers of all kinds of nebulae. Sir John Herschel counted 278 nebulae in the Nubecula major, and seventy or eighty nebulae lay around in detached masses. Since stars from the ninth magnitude downwards are mixed up with these nebulae, it is clear, as Sir John Herschel points out, that the theory of the great distance of nebulae as compared with stars, formerly held, must fall to the ground, even independently of the spectroscopic investigations, which have solved the same problem from another standpoint.

**MAGEN'TA**, a town and commune of Italy, in the province of Milan, 16 miles west of Milan, with a population of about 6000. It contains four churches, one of considerable size, and manufactures of soap, wax candles, and whetstones. The wine of the district is held in good repute. There is a station near the town on the railway from Turin to Milan.

Magenta was the scene of a great battle in the war which established the independence of Italy. In the spring of 1859 the Austrians had entered Piedmont, and advancing to within a few miles of Turin, occupied the country between the Dora, Sesia, and Ticino, while the Sardo-French army was posted south of the Po, supported by Alexandria and Casale, and receiving supplies from Genoa. Towards the end of May the French emperor suddenly changed his plan of operations, and by a brilliant series of movements turned the right wing of the Austrians and encamped his army on the west side of the Sesia. On the morning of the 4th of June, the allies, in two great divisions, one under General M'Mahon, and the other under Napoleon III. himself, moved forward from Turbigo on the north and Novara on the south, in order to effect a junction at Magenta, and fall with overwhelming force on the Austrians. Napoleon, in crossing the Ticino, met with an obstinate resistance, and the issue seemed doubtful until M'Mahon, successful on his side, brought up his division to the emperor's aid, and advanced on Magenta. About six o'clock the Austrians occupied the town, and bravely defended it for ten hours against the combined forces of M'Mahon, of Canrobert, and of the Imperial Guard, which, after a furious strife, had fought its way from the Ponte Nuovo, each house being defended and stormed as if it were a battery. The arrival of the French reserves compelled the Austrians, though reluctantly, to fall back; and on the morrow, defeated and disorganized, they retired in a southerly direction, leaving open the road to Milan to Napoleon and Victor Emmanuel. The Austrians lost 13,000 killed and wounded, and 7000 prisoners; the French 3700 killed, and 735 prisoners.

The victory was commemorated by the inauguration of a monument on the battle-field. It consists of an imposing obelisk placed upon a solid cubic basement; total height, 65 feet. The sides are ornamented with marble bas-reliefs, representing the Emperor Napoleon, Victor Emmanuel, and the principal types of the French army. It is from Magenta that one of the colours produced from coal-tar derives its name.

**MAGGIORE, LAGO DI** (pronounced *Majior'ay*), the most westerly of the great lakes in North Italy, surrounded by Lombardy, Piedmont, and Ticino. It is the *Lacus Verbanus* of the Romans, and has a length of 37 miles, a breadth of from 2 to 6 miles, and an area of 82 square miles. Its greatest depth is 2666 feet, or about 2000 feet below the sea level. The north banks are bounded by lofty mountains, for the most part wooded, while the east shore towards the lower end slopes gradually away to the level of the plains of Lombardy. The west bank affords a succession of charming landscapes, and altogether it is

considered the most beautiful of the Italian lakes. The water is of a green colour in its north arm, and deep blue towards the south. Its waters are well stocked with fish, and, like all Alpine lakes, its navigation is dangerous from sudden squalls.

The Borromeo Islands are situated in a bay on its west side, opposite to the mouths of the Ticino. Of these the Isola Bella and the Isola Madre are the most famous. They are of small size, and previously to the middle of the seventeenth century were little better than bare rocks, but being the property of Count Vitaliano Borromeo, a descendant of the celebrated St. Carlo Borromeo, he resolved to make them his residence, and to convert them, according to the taste of the time, into a sort of Italian paradise.

**MAGGOT** is of the popular larvæ of insects. [See LARVA.] The term maggot seems especially applied to larvæ which feed on animal, and particularly putrescent, matter, and is perhaps most generally given to larvæ of dipterous insects or flies. It is also applied to footless larvæ, such as those of the hive-bee.

**MAGI.** See MAGIC.

**MAGIC** is the pseudo-art by which the mediæval philosophers professed to obtain a mastery over the secrets of the universe, and to communicate with demons and invisible spirits. In a more general sense it includes every species of divination of the future, whether under the names of astrology, necromancy, sorcery, vauderie, or witchcraft; while of late years it has even been made to include the common tricks and sleight-of-hand performances of vulgar conjurers. In its original application it signifies the doctrine of the Magi; because the Chaldean priests were supposed to have gained their extraordinary knowledge, superior wisdom, and remarkable skill from familiar spirits, or other supernatural agents. It may therefore be briefly defined as the art or science which teaches how to perform various phenomena, and obtain an insight into coming events by the application of mysterious means, known only to the initiated, which command the services and interposition of good and evil spirits.

Magie appears to have had its origin on the plains of Assyria, and the worship of the stars was the creed of those pastoral tribes who, coming down from the mountains of Kurdistan into the wide level where Babylon afterwards raised its towers, founded the sacerdotal race of the *Chasdim* or *Chaldeans*. To these men were soon allotted peculiar privileges and ascribed peculiar attributes, until, under the name of Magi, they acquired a vast and permanent influence. Their temples, astronomical observatories as we may call them; and the legendary tower of Babel, in the Book of Genesis, is probably but the mythical equivalent of a vast edifice consecrated to the study of the seven planets, or, perhaps, as the *Diab* (count or palace) of *Bel*, to the brilliant star of good fortune alone. Availing themselves of the general adoration of the stars, they appear to have invented a system of astrology--the apotelesmatic science--by which they professed to decide upon the nature of coming events and the complexion of individual fortunes, with especial reference to the planetary aspects.

In Persia magic assumed a yet more definite development. The Chaldeans had attributed the origin of all things to a great central everlasting fire. The foundation of the Persian system, usually ascribed to Zoroaster or Zoroaster, was the existence of two antagonistic principles--Ormuzd, the principle of good, and Ahriman, the principle of evil. In Persia everything associated with science or religion was included under the denomination "magic." The Persian priests were named the Maguise or Magi, but they did not arrogate to themselves the entire credit of intercourse with the gods. Zoroaster, who was king of Bactria, made some reservations for the sake of exalting the regal power, and taught that the kings were illuminated

by a celestial fire which emanated from Ormuzd. Hence the sacred fire always preceded the monarch as a symbol of his illustrious rank; and Plato says the Persian kings studied magic, which is a worship of their gods.

It was, however, in Egypt that magic received its development as an art. The most famous temples in Egypt were those of Isis, at Memphis and Busiris; of Serapis, at Canopus, Alexandria, and Thebes; of Osiris, of Apis, and Ptah. Isis, the wife of Osiris, derives her name from the Coptic word *isi*, or plenty, and would seem to typify the earth; but she is usually represented as the goddess of the moon (Gr. *Kerasphoros*, the horn-bearing). Isis was also employed as a personification of wisdom, and to a certain extent she may be regarded as a symbol of the eternal will, her shrines bearing the enigmatic inscription--"I am the all that was, that is, that will be; no mortal can raise my veil." Horus was the son of Isis, and was instructed by his mother in the art of healing. Horus, synonymous with light, is the king or spirit of the sun. Astrological science and magic were earnestly and eagerly studied by the Egyptian priests. It was their belief that the different stars exercised a powerful influence on the human body. Their funeral ceremonies may be quoted as an illustration, for they agree in sharing among the divinities the entire body of the dead. To Ra, or the Sun, they assigned the head; to Anubis, the nose and lips; to Hathor, the eyes; to Sekh, the teeth; and so on. To ascertain the nativity the astrologer had only to combine the theory of the influences thus exercised by these star-related gods with the aspect of the heavens at the moment of an individual's birth. It was an element of the Egyptian as well as of the Persian astrological doctrine that a particular star controlled the natal hour of everyone.

Through the instrumentality of Orpheus, Musæus, Pythagoras, and others, who had travelled in Egypt, and been initiated by the priests into their mysteries, magic found its way into Greece, and there assumed various novel developments. The Greek sorcery was chiefly manifested in the peculiar rites of the Orphicthelesta, the invocation of the dead, the cave of Trophônios, the oracles of the gods, and the worship of Hekate. The latter mysterious deity, the moon-goddess, was the patron divinity of the sorcerers. From her, as from one of the powers of the nether world, proceeded phantoms that taught witchcraft, hovered among the tombs, and haunted crossways and places accursed by the deed of the murdered or the suicide.

Mormo, the Cerceps, the Empusa, were among the goblin crew that did her bidding.

Rome borrowed her magic, no less than her art and literature, from poetic Hellas. The occult science does not appear to have been known to the Romans until about 200 years before the Christian era. But they had previously cultivated a modification of the Etruscan sorcery, comprising the divination of the future, the worship of the dead, the evocation of their *humores* or phantoms, and the mystic ceremonies of the *Mama-Genita*, a nocturnal goddess of awful character. Numa was the great teacher of the ancient Roman magic, which probably partook both of a religious and medical character.

The Christian church, at the outset of its history, forbade the practice of pagan magic, but taught what may be described as a magic of its own. Both Origen and Tertullian held that mania and epilepsy were produced by the action of demons or evil spirits confined within the bodies of the sufferers, and that these were to be exorcised by certain forms of words. The church formally recognized the efficacy of exorcism in 367, when the Council of Laodicea ordained that only those should practise it who were duly authorized by the bishops. Connected with magic and magical rites were the supposed curative properties of the relics of saints, and the divine origin popularly ascribed to visions and ecstatic trances.

In the middle ages magic asserted its supremacy over the whole of Christian Europe; but it had entirely lost the religious character communicated to it by the Chaldeans. It had degenerated into the "black art." It dealt only with the night-side of nature, with the Evil One and his imps, with the loathsome practices of witchcraft and the enchantments of the necromancer. The scholar rose superior to this low kind of theurgy, but he, too, no longer sought communion with the heavenly powers; he devoted all his energies to the discovery of the philosopher's stone and the elixir of eternal youth, to the sources of illimitable wealth and endless life.

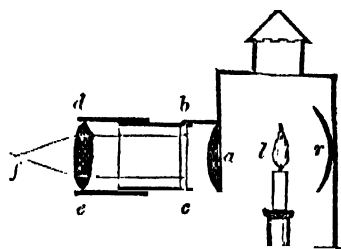
At the present day the belief in magic, witchcraft, and sorcery is found prevailing everywhere among savage and semi-civilized peoples, and a curious family resemblance may be traced in the rites practised by those who lay claim to the possession of occult powers. Even in the nations most advanced in civilization the peasantry and the uneducated classes, as a rule, still believe in the efficacy of charms, spells, the interpretation of dreams, the power of the gypsies to tell fortunes, and more rarely in the existence of witchcraft. Even among those who have enjoyed the advantages of education a vast amount of credulity in reference to magic still prevails, and clever impostors are still able to reap a rich harvest by pretending to be the possessors of occult powers. The tricks of spirit-rappers, slate-writers, and other mediums have been repeatedly exposed, but they are as yet by no means an extinct race. The latest exploits of some members of this class as teachers of theosophy, the occult sciences, esoteric Buddhism, &c., are interesting as showing how the belief in magic yet lingers in spite of the influences of education, and also of the readiness with which persons of whom better things should be expected fall a prey to any impudent charlatan willing to pander to their superstition.

**MAGIC LANTERN** is a species of lucernal microscope invented by Kircher in 1615, its object being to ob-

A remarkable improvement in the manner of employing the magic lantern was first exhibited in London by Philipsthal in the year 1802. The lantern itself was similar to, but larger than that which served for more general purposes, and the images were represented on a transparent screen, which was stretched in a vertical position across a theatre or an apartment; and this being made quite dark, the spectators occupied the space in front of the screen, while the apparatus was disposed on the opposite side. All light was excluded both before and behind the screen, except that which, in proceeding from the lantern, produced the image to be observed; and the screen being itself invisible the spectators could scarcely divest themselves of the idea that they were looking into a dark cavern, in which the objects appeared to be gradually advancing towards or receding from them. The illusions produced caused the name of *phantasmagoria* to be applied to the apparatus. The introduction of the lime light, and still more recently of the intensely powerful electric light, have much improved the effect of objects exhibited by the magic lantern, and it is now among the most valued appliances of the professor of science. A diagram scratched with a pin's point upon a smoked glass becomes visible in its enlarged form to a large audience; photographs and small pictures are enlarged to any extent, in fact a good photograph of any small part of the moon seen by the help of an electric lantern is one of the most wonderful and beautiful objects which science has revealed to us. Further, with suitable appliances, small living objects, such as inhabit stagnant waters, or transparent parts of living plants and animals, &c., may be made visible to numbers of persons at once, many processes of nature are seen without the fatigue of the microscope, &c. In fact for purposes of illustration the magic lantern, once neglected as being merely an ingenious toy, is now fast becoming indispensable. The name given to the instrument is certainly most unfortunate.

**MAGIC SQUARE**, a term applied to a set of numbers arranged in a square in such a manner that the vertical, horizontal, and diagonal columns shall give the same sums. Such arrangements were known very early to the Hindus, Egyptians, and Chinese, among whom, as also among the Europeans of the middle ages, a belief existed that such squares had astrological and divinitory qualities. Emanuel Moschopolos, of Constantinople, wrote on them in Greek in the middle of the fifteenth century. (See Montucla's "History," vol. i. p. 316; "Encyclopédie Meth.," art. "Quarrés Magiques;" Hutton's "Dictionary," and the "Mathematical Recreations" of the same author.)

The following is a sample of a magic square of 21,156:—



tain an enlarged representation of figures on a screen in a darkened room, by means of the pencils of light issuing from a lamp or candle and passing through a convex lens. Essentially it consists of a powerful lamp, *z*, the light of which is concentrated by the reflector *r* upon the lens *a*. The only use of this lens is to throw the light in a proper direction upon a transparent picture contained in a slide, inserted at *b c*. This picture is painted with bright transparent colours upon a thin plate of glass. The figures of the picture being strongly illuminated, the light proceeds in a strong parallel beam to the lens *d e*, which has its focus at *f*. After this point it continues to diverge in the directions *f g* and *f h*, until it is received upon a screen placed for the reception of the image. It is thus manifest that the size of the image will depend on the distance of the screen from the focal point *f*; but bearing in mind that the intensity of light diminishes as the square of the distance, the image becomes less and less bright as the distance of the screen is increased. The tube in which the lens *d e* is placed is also made movable for the purpose of adjustment, as in the case of the telescope.

356	3852	1290	3492	936	3132	574	2772	216
8888	1332	3528	972	3168	612	2412		
2418	288	098	4284	3012	1368	3564	1008	2838
684	2484	324	2124	432	1764	3960	1104	
2880	720	2520	360	216	156	1800	3600	14
1116	201	756	2556	336	2196	3996	1836	136
6312	1152	2552	792	250	36	2232	1032	872
1548	3318	1188	2688	132	2628	72	2268	1038
3744	1581	3384	828	302	468	2664	108	3304
1980	378	1224	3120	86	9096	594	2700	141
4176	162	816	1260	1152	900	3096	54	736

The methods which have been given for the formation of magic squares follow different rules, according as the number in each side is odd, evenly even, or oddly even.

**MAGILUS** is a remarkable genus of molluscs belonging to the whelk family (Buccinidae). These gasteropods live in the Red Sea and on the coasts of Mauritius and Java, and bore into live corals, especially those of the genus *Meandrina*. When young the shell is thin and spiral, but when adult it becomes solid, of a white colour, spiral for three or four whorls, and then produced into an elongated irregular tube, solid posteriorly, but with a small cavity at the end for the reception of the body of the animal, and a siphonal keel on the left side. As the shell extends the tube behind becomes filled up with solid calcareous matter, and is left fixed in the substance of the coral. It has been shown that the *Magilus* grows horizontally, eating its way through the coral near the living surface, so as probably to reach and devour the coral-polyps within. The tube is sometimes as much as 15 inches in length. The best known species is *Magilus antiquus*.

**MAGISTER EQUITUM.** See MASTER OF THE HORSE.

**MAGISTRATE**, a word derived from the Latin *magistratus*, which contains the same element as *magnus* and *magister*, and signifies both a person and an office. A Roman *magistratus* is defined to be one who presides in a court and declares the law; that is, a judge. The kings of Rome were probably the sole *magistratus* originally, and on their expulsion the two consuls were the *magistratus*. In course of time other offices, as those of prætor and ædile, were created; and those who filled these offices were elected in the forms prescribed by the constitution. The original notion of a *magistratus*, then, is one who is elected to an office, and has jurisdiction.

In England the term magistrate is usually applied to justices of the peace in the country, to borough magistrates in municipal towns, and to those called police magistrates, such as there are in London and some other large towns. It has also been applied in other ways; for instance, people have sometimes said that the king is the chief magistrate in the state. But these applications of the term do not agree with its proper sense. A Roman *magistratus* was elected, and so far he differed from an English justice of the peace; he also exercised delegated power in his judicial which spect, all ing electe he differed from the King of England, who is not elected, and does not exercise delegated jurisdiction, but delegates jurisdiction to others.

In Scotland the term magistrate includes all in authority. The sovereign is the first or supreme magistrate of the kingdom; all the others, such as judges, are deemed subordinate magistrates. In common language, however, the term magistrate applies in a particular manner to the provost, bailies, commissioners, and stipendiaries of burghs. Justices of the peace also receive this appellation. Magistrates of royal burghs have much the same civil jurisdiction within the burgh as has the sheriff, except where by statute special and exclusive power has been conferred on the sheriff. The criminal jurisdiction of the magistrates is now limited to matters of police, unless when, as in Edinburgh, Glasgow, and Aberdeen, they are vested with a right of sheriffship, in which case they have the same criminal jurisdiction as the sheriff.

**MAGLIABECCHI, ANTONIO**, the finest specimen yet developed of the genus bookworm, was born in Florence, 28th October, 1533. He was brought up to the trade of a jeweller, but his ardent devotion to literature obtained for him in 1573 the appointment of librarian to the Grand-duke Cosimo III., a post which he retained until his death. Being now in a position to gratify his love of reading without stint he abandoned himself wholly to the acquisition of knowledge, and his habits became those of a literary

ogre. Squalid in dress and person he passed whole days and nights among his books, often without leaving his chair or changing his clothes. He could hardly spare time for his meals, and his food was that of a hermit or ascetic. He is said never to have gone further from Florence than to the neighbouring town of Prato, and that only once for the purpose of inspecting a MS. It was also said of him that he read every book he could get hold of, and he remembered everything that he had read. Certainly he was a prodigy of memory, and he served as a walking encyclopædia to the grand-duke and to the scholars and literary men of Florence. Tradition asserts that the townspeople when they were in want of information on any subject were accustomed to wait upon him as he walked from his house to the library, and that his stores of information were always at the service of inquirers. His only publications were some letters, a short catalogue of MSS. in the Laurentian Library, and the editions of the "Hecleporicon" of Ambrosio, the "Camaldulensis" and the "De Præstantia Virorum sui ævi" of Benedetto Accolti. He died 12th July, 1714, bequeathing his library of 30,000 vols. and MSS. to Florence, where it is still preserved entire.

**MAGNA CARTA.** Though the "Great Charter" (*Magna carta* or *Magna charta*) granted by King John was not the original of those privileges and franchises which the barons (or chief tenants of the crown), the ecclesiastical persons, citizens, burgesses, and merchants enjoy, it defined them, it formed in its written state a document to which appeal might be made, under whose protection any person who had any interest in it might find shelter, and which served, as if it were a portion of the common law of the land, to guide the judges to the decisions which they pronounced in all questions between the king and his subjects.

King John was compelled to grant the charter by an armed force, consisting of a very large portion of the baronage, which he was unable to resist. The charter was sealed in the open field, at a place called Runnymede, between Windsor and Staines. The memorable day was 5th June, 1215. See JOHN.

Always throughout the earlier history of England the "laws" of some previous (so-believed) golden epoch were desired in seasons of tyranny; thus the "laws of Alfred" assumed to be a re-issue of the "laws of Ine" (an ancient king of Kent about 690), and the "laws of Cnut" (Canute) were a re-issue of the code of Alfred. The "laws of Edward the Confessor" repeated and extended those of Cnut, and in their turn became the longing of the nation, oppressed by the stern and foreign Norman rule. At length Henry I., one of our most astute rulers, yielded to the national revival of English spirit, and re-enacted the long-desired "laws of Edward" in the famous Charter of Liberties of 1100, given to the unbounded joy of his subjects at his accession. Upon the fourteen articles of this charter, confirmed successively by Stephen and by Henry II., the bulk of the Great Charter (*Magna Carta*) of John, son of Henry II., is based. It has sixty-three articles, and most of these are equivalent to one of the forty-nine articles of the barons which were presented to the enraged and humiliated king for his acceptance. In some instances the charter goes beyond the articles.

The most important articles of *Magna Carta*, all of which were absolutely new as regards Henry I.'s Charter of Liberties, though most of them had been foreshadowed by the wise government of that born statesman and ruler, Henry II., are to this effect:—(A) That no "sentage" or "aid," with the exception of the three ordinary feudal aids (which amounts to saying that no imperial taxation), shall be levied without the consent of Parliament. (B) That a Parliament of the whole kingdom (meaning a Parliament of barons or tenants-in-chief) shall be summoned in a regular manner for the imposition of aids, except the three ordinary aids.

(C) That no freeman shall be imprisoned, exiled, or otherwise punished except by the lawful judgment of his peers, or by the law of the land, Art. 39. (D) That justice shall not be sold, nor denied, nor delayed to any one (Art. 40), and that the Court of Common Pleas should not follow the king's person, but be held in some fixed place, Art. 17. Many of the oppressive feudal exactions were abolished, and others fixed in their sums. Widows were protected from being forced to remarry, that the taxes on their marriage might be levied by the crown, &c. In these most important ways the royal prerogative was for the first time accurately defined and limited, and the large number of copies made, and the solemn way in which the charter was published, sworn to at every hundred-mote and town-mote throughout the whole kingdom, enable it always hereafter to be readily referred to. Towns were secured in the enjoyment of their charters and customs, and the foundations of trade then solidly laid. The execution of the charter was intrusted to a committee of twenty-four of the greatest barons.

At John's death, the regent Pembroke reissued the Great Charter, omitting the clauses referring to taxation because of the king's minority, Henry III. being but quite a boy. He promised to re-enact them as soon as the king was old enough to reign. Next year (1217) it was found necessary to secure the allegiance of the people (the French being still in the land) by again swearing to the charter, and this time all the clauses relating to the forests were extracted and taken into a charter by themselves. Henceforward the two charters, *Magna Carta* and *Carta de Foresta*, were separately enacted and dealt with. In 1218 the two charters were again solemnly confirmed, and again in 1223; at each re-enactment certain new provisions being introduced. In 1225 Henry issued a fresh charter, "by our spontaneous good-will," as if to assert a freedom of action in the matter, and also in the last clause stating the important fact that the charter was issued in return for a grant of a "fifteenth," that is, a fifteenth part of all personal property and income, thus first acknowledging the corner-stone of our parliamentary liberty, of claiming redress of grievances before granting supplies. The tyrannous, and at the same time incapable, government of Henry III. soon led to many revolts, those of 1237 and 1244 being the main struggles, and finally, in 1253, the king found himself at his wit's end for money, and was forced to give up his illegal taxation and confirm the charters in return for a grant of money. The closely analogous way in which his barons, after he had again broken faith, pinned him down to the Provisions of Oxford, as their fathers had pinned John to those of Runnymede, was not equally efficacious, as St. Louis (Louis IX. of France) interposed, and his verdict in favour of the king was of such solemn weight, owing to his remarkable ascendancy over men's minds, that the barons submitted. Again and again the barons tried to get the Great Charter obeyed, until at last, under Simon de Montfort, they undertook the government for themselves, and made the king a prisoner.

After Evesham, and the death of De Montfort, the young Prince Edward really ruled, and that wise and good prince, in the Dictum de Kenilworth, which he caused his father to proclaim in 1266, undertook to observe all charters heretofore given, and to govern legally, though by giving this Dictum voluntarily he had managed to preserve the royal prerogative and power undiminished. His wars forced Edward the Great occasionally to overstep the bounds of taxation fixed by *Magna Carta*; and the public dissatisfaction, led by the Archbishop Winchelsey, Humphrey Bohun, earl of Hereford, and Roger Bigod, earl of Norfolk, forced him at last to the explicit *Confirmatio Cartarum* (confirmation of the charters) in 1297, which recites and re-enacts the whole of *Magna Carta* in clear legal French. A Latin copy, which uses the word

*tallagium*, is called *De Tallagio non Concedendo*, and is in all probability a draft, or an unauthorized translation of the true *Confirmatio*, from which it differs in other particulars as well as the insertion of the word *tallage*. This is necessary to mention, as the famous Petition of Right, in referring to the legislation of the great Edward in 1628, refers to *De Tallagio* and not to the *Confirmatio Cartarum*, and *De Tallagio* was expressly received as a statute by the judges (in 1637) in Hampden's case. In March, 1299, Edward confirmed the charters of the forests, "saving the rights of our crown," a clause which stung his Parliament to fury, and which he at once omitted, when issuing a new charter two months later. In March, 1300, certain articles in the charters (*Articuli super Cartas*) were issued as a supplement to provide for a few overlooked abuses (purveyance, &c.), and for commissioners to supervise the administration of the forests and guard the charters from infringements, &c.

Finally the complete charter was confirmed by Edward in 1301 at the Parliament of Lincoln, in return for a money grant, and has never since been altered. It is the keystone of the liberties of England, the source whence all her other liberties proceed.

Many pilgrimages are made by lovers of English freedom to its cradle at Runnymede, opposite which, on 5th June, 1215, King John lay on the opposite bank, the barons on the marshy flat itself. They met together on the island in mid stream, and the whole proceedings, so momentous in their consequences, took but one day, so impotent was the king to resist. One copy of *Magna Carta*, with John's seal yet attached and the signatures of the barons, brown with age, and partly destroyed by fire, is readily accessible at the British Museum. The feelings with which one gazes upon this old tattered fragment of parchment are fitly described by the gravest historians as those of reverence. It is certainly enough to move the most callous of men, to see before his eyes the actual foundation-stone of that vast and infinitely diverse structure which is the admiration and envy of all nations—the most perfect, because the most elastic, system of polity the world has yet seen, which each generation at its will may and does alter to its own needs, but which each alike respects, preserves, and reveres; such, and resting upon this brown shrivelled parchment and what is signified thereby, is the British Constitution.

**MAGNA GRÆCIA**, a term used to designate the south of Italy, which, with its flourishing Greek colonies, was, until a late period of the Roman dominion, Greek and not Roman in its population and manners. It does not appear to have been applied to the country north of Cumæ and Neapolis (Naples). The term is used by Polybius and subsequent Greek and Roman writers.

**MAGNESIA**. See **MAGNESIUM**.

**MAGNESIAN MICA** is the name often applied to **BIOTITE**, from its being largely composed of silicate of magnesia; it is one of the most commonly occurring varieties of the dark coloured micas. It crystallizes in the hexagonal system, and is usually found in trap and similar eruptive rocks.

**MAGNESITE** is the carbonate of magnesia. It usually occurs massive or fibrous, but sometimes in crystals of the hexagonal system. It is found associated with magnesian rocks, and is used for the manufacture of *Epsom salts* or sulphate of magnesia; for this the carbonate is treated with sulphuric acid.

**MAGNESIUM**. This metal was first obtained by Davy from magnesia the oxide, by electrolysis. It is found largely diffused in nature, among minerals in combination, as oxide, carbonate, borate, and phosphate; also abundantly as silicate in meerschaum, steatite, hornblende, asbestos, talc, and chrysotile. As chloride it is found in sea-water, and as chloride and sulphate in many mineral

**waters.** As sulphate it is found abundantly in the Stassfurt mines, and known as kieserite; also as carbonate and phosphate in the bones of animals, and in many plants in combination with organic acids. All sea-weeds contain it, some in considerable quantity. Magnesium is placed among the metals of the alkaline earths, but its salts more closely resemble those of zinc. It is obtained on the large scale from the chloride by fusion with metallic sodium, and purified by sublimation. It is a silver white crystalline metal, having a specific gravity of 1.75, and is easily drawn into wire. It melts and volatilizes at the same temperature as zinc, and is unalterable in dry air. When heated it burns with an intense white light, forming magnesia. It is much used in wire and filings for pyrotechnic and illuminating purposes. The light is rich in actinic rays, and is useful for taking photographs. The light is also used for signalling, and has been seen at sea at a distance of 28 miles. It is useful in chemical analysis, replacing zinc, on account of its purity and the absence of arsenic, and as a reducing agent. It burns also in chlorine gas. The symbol is Mg, the atomic weight 24. It forms only one oxide, magnesia ( $MgO$ ). This is a white, tasteless, inodorous, bulky powder of specific gravity 3.2. It can be melted by the oxyhydrogen blowpipe into a vitreous enamel. On account of its highly refractory character it is used in the manufacture of bricks for furnace beds, where high temperatures are required. It is almost insoluble in water. It is usually obtained by heating the carbonate. It occurs native as brucite, which is a hydrated magnesium oxide.

**Magnesium carbonate** ( $MgCO_3$ ) is found native in large quantity as magnesite; it is almost pure, and is much used in the manufacture of Epsom salts and other medicinal salts of magnesia. It is also a large constituent of mountain limestone or dolomite, of which the Houses of Parliament are built. Obtained by precipitation from solution by an alkaline carbonate, it is a white light powder containing some hydrate, and having the formula  $3MgCO_3 \cdot MgO \cdot 5H_2O$ ; it forms double carbonates with all the alkalis. It is soluble in water containing carbonic acid, the solution forming the well-known medicine, fluid magnesia.

**Magnesium sulphate**, or Epsom salts ( $MgSO_4 \cdot 7H_2O$ ), is a well-known salt, and a large article of manufacture for medicinal purposes. It contains seven equivalents of water of crystallization, and may be easily mistaken for zinc sulphate, which is poisonous. This salt is found in many spring and well waters, especially in those of Surrey in the vicinity of Epsom, from which village it derives its name, and where it was first discovered in 1675 by Dr. Green. It is also found in sea-water, but the largest source of its manufacture is kieserite as obtained at Stassfurt. It was formerly obtained from dolomite. Sulphate of magnesia is a convenient antidote in cases of poisoning by the salts of lead or barytes.

**Magnesium chloride** ( $MgCl_2$ ) is an important constituent of sea-water. It is a crystalline bitter salt, very soluble in water and in alcohol, and very deliquescent. At a red heat it melts to a clear liquid. The solution, when heated, decomposes; hydrochloric acid is given off, and magnesia deposited. The chloride and the sulphate are both used as a dressing for cotton goods, and in fixing aniline colours.

**Magnesium bromide** ( $MgBr_2$ ) and **magnesium iodide** ( $MgI_2$ ) resemble the chloride; both are decomposed when the solutions are evaporated.

**Magnesium fluoride** ( $MgF_2$ ) is a white powder, insoluble in water and in most acids.

**Magnesium nitrate** ( $Mg(NO_3)_2 \cdot 3H_2O$ ) is an extremely deliquescent crystalline salt, made by dissolving magnesia in nitric acid.

**Magnesium ethyl** ( $MgC_2H_5$ ) is one of the organo-metallic

bodies which have excited much interest among chemists. It is a colourless liquid, with strong garlic odour, which takes fire in the air and violently decomposes water.

The salts of magnesia are generally colourless, and are distinguished from those of other metals by the insolubility of the ammonia-phosphate, in which form magnesia is usually estimated. It is distinguished from zinc and other metals by not being precipitated by sulphide of ammonium, and from the alkaline earths by the carbonate not being precipitated in the presence of ammonium chloride. Heated before the blowpipe with cobalt nitrate, magnesium salts leave a rose-coloured residue.

**Medicinal Properties of Magnesia.**—Oxide of magnesium, termed also, from the mode of procuring it, calcined magnesia, or *magnesia usta*, is an alkaline earth, possessing the usual qualities of alkalies in their habitudes with acids, and likewise the property of exciting generally purgative action of the intestines. This last-mentioned power gives it a distinctive character among alkaline remedies, as it can be employed not merely to counteract acidity, but also to remove the exciting cause when that consists in the presence of crude or undigested acid-yielding materials in the stomach. Its action as a purgative seems mainly to depend upon its meeting with acids in the stomach, and so forming soluble salts. When these are not present the magnesia remains undissolved, and if used repeatedly may accumulate in the intestines, and, becoming agglutinated by the mucous secretions, give rise to much uneasiness. When, however, acidity exists, either along with constipation or diarrhoea, more particularly in children, from the milk disagreeing, or from a diet unsuited to their delicate organs of digestion being forced upon them, magnesia is a very proper medicine, especially as it appears to possess a specific power of diminishing gastro-intestinal irritation. It is generally expedient to add rhubarb to it, and combine it with some carminative. In such a state of combination it is peculiarly useful in what is termed *diarrhoea crapulosa*, arising from too great a mixture or too large a quantity of food.

**Citrate of magnesia** is prepared from *magnesia alba*, citric acid, bicarbonate of soda, and sugar. It is made up in the form of granules, which, when thrown into water, dissolve with effervescence, and it forms a pleasant mildly aperient draught, resembling the *limonade purgatif* of France, which is generally prepared in a liquid form.

**MAGNET** (derived from the Gr. *magnēs*) is a metallic body possessing the remarkable property of attracting iron and some other metals. Stones with this property were found abundantly near Magnesia in Lydia, from which circumstance the name was derived. The attracting power of the magnet-stone, or *lodestone*, was known at a very early period, as references are made to it by Aristotle, and more particularly by Pliny. It is a heavy ferruginous ore of a dull grayish colour. It is now scientifically called Magnetite, and is an iron ore with the chemical composition  $Fe_3O_4$ . It is also found in Spain, Elba, Sweden, and Arkansas, but not always in the magnetic condition. The ores of cobalt and nickel also frequently possess the magnetic properties.

If a piece of iron, or, better still, of steel, be rubbed with a lodestone an artificial magnet is produced, having practically identical properties; such a bar or needle is also called a magnet. A magnetic needle is best fitted for manifesting the magnetic properties. In 1600 Dr. Gilbert published the great treatise which founded the theory of magnetism, and for the first time demonstrated that the great attractive power of a magnet lay in two regions or *poles*, usually the ends or nearly the ends of the magnet. In fact just in the middle, equidistant from the poles, there is practically no attraction at all. One of these poles always seeks to point towards the north when free to move, and the other, of course, to point towards the south.

The universal law, that reaction is coexistent with action, implies that iron must react on the magnet; and it is evident that all the iron in the mass of the earth must act upon a magnet. Hence it follows as a mechanical consequence, that if a magnetic needle or cylinder be suspended by its centre of gravity, so as to be free to move in any direction round that point, it will not take an arbitrary position like unmagnetized bodies, but must take a specific direction, namely, that which represents the resultant of all the magnetic forces to which it is subject. This property was not known in Europe (though it was earlier known in China) till about the twelfth century. See DECLINATION and INCLINATION.

During a thunderstorm the poles of a magnet are frequently inverted; the appearance of the aurora borealis is often attended with vibrations of the compass needle, to the extent of several degrees. The actual mode in which the aurora is produced being unknown, it is impossible to decide whether the aurora is itself the cause of this magnetic phenomenon or whether both are attributable to some unknown common cause.

The earliest method of magnetizing a bar of hard iron or steel was by drawing it throughout its whole extent at right angles over one of the poles of a strong magnet; but the magnetism thus developed is feeble, and apparent only at the extremities of the bars, or in some consecutive points formed by peculiarities in the material of the bar, or in the mode of operation. A better method is to use two magnets, letting them touch the bar to be magnetized by their north-seeking and south-seeking poles respectively, and in the middle. Then draw along the one magnet to the intended north pole of the bar, and the other to the intended south pole and back, always leaving off at the middle. Then turn the bar over and repeat the operation on the other side. If the bar be supported by two magnets at their poles (the poles being suitably opposed) the effect is stronger. As regards the capacity for permanent magnetization bodies differ largely, even those which are magnetic in their affinities. Thus a string of iron nails hung on (head to tail) to a magnet, will fall to pieces if the uppermost nail be removed, but a string of needles will retain the magnetization some little time. It is found much harder to magnetize steel than iron, but also it is much harder to demagnetize it, and the harder the steel the greater its retentivity. By rough usage it is possible to destroy the power of a magnet and also by heating it to redness. Chilling a magnet increases its power, on the contrary, so much that manganese only becomes magnetically attractive when it is cooled to  $-4^{\circ}$  Fabr. ( $36^{\circ}$  below freezing-point). It is found, however, that steel magnets lose their magnetism if chilled down to  $-118^{\circ}$  ( $180^{\circ}$  below freezing-point).

The best form of magnet is the horseshoe, where an armature or keeper can be placed across the poles, and where also both poles can attract a piece of iron at once. A horseshoe magnet will lift three or four times the weight that an equal bar magnet can. But for scientific purposes bar magnets are usually preferred. It is possible to *supersaturate* a piece of metal with magnetism, in which case it soon loses its excess of force and remains then simply saturated.

**MAGNETIC BATTERY** is the name often given to a combination of magnets. Such a combination is always weaker than the sum of the strengths of the single magnets, since each north-seeking pole induces south-seeking tendencies in its next neighbour, and thus weakens its north-seeking powers.

**MAGNETIC IRON ORE.** See MAGNETITE.

**MAGNETIC PYRITES** is a mineral resembling iron pyrites, but having a bronze appearance and exhibiting magnetic properties. It consists of iron sulphide ( $\text{FeS}_2$ ), but sometimes contains sufficient nickel to render it a valuable ore of that metal.

**MAGNETISM.** If we take a natural or artificial magnet, and spreading over a piece of paper a quantity of fine iron filings, place the magnet on the paper, on taking it up we shall find that the iron filings are attached to it in some degree over all its surface, but they will be principally accumulated at two points situated near the ends of the magnet: these points are called the poles of the magnet. Sometimes, when a magnetic bar is rolled among iron filings, we may find several such points along the bar; the magnet is then said to have consecutive points. When a magnetized needle is suspended horizontally on a pivot armed with agate, it assumes a particular direction, nearly north and south. The pole N, at the north extremity of the needle thus adjusted, is commonly called the north pole of the needle; the other, S, the south pole; though the contrary names, as will appear subsequently, would be more correct according to the theory of magnetism. If we now bring a piece of soft iron near the pole N, it will be attracted to that pole and become attached to it, so that the exertion of a mechanical force is necessary to separate them. In this way a magnet held vertically will sustain a piece of iron, provided the weight of the iron does not exceed the magnetic force. The pole S has a similar attractive power on iron; the cause of this attractive power is called *magnetism*.

The force of magnetism is exerted without alteration through substances which are not magnetic, and the same is true with respect to the electrical forces when non-conducting bodies are interposed in the direction of their action. On the other hand, the effect of the magnetic forces is considerably modified when substances which are capable of becoming magnetic by influence are situated near the magnet; and a similar effect takes place by the decomposition of the neutral electricities when under the influence of an electrized body. See ELECTRICITY.

In order to observe the action of magnets on each other, make two magnets or magnetic needles float on water, distinguishing the poles of one by N and S, and of the other by N' and S'. Bring either the pole N near to S', or S to S': the needles or magnets will separate to a greater distance, and with the greater energy the nearer these poles are placed to each other. On the contrary, if we bring S and S' near each other, the needles will approach and unite those points; and the same happens when the points N' and S are made contiguous: hence this law—*Magnets of the same name are mutually repulsive; those of contrary names are mutually attractive*. In the article ELECTRICITY it has been shown that the same law is true with respect to the two electricities. It is therefore manifest that, the earth being a huge natural magnet, it is the south pole of the magnetic needle which points to the north pole of the earth; and to avoid this contradiction in terms some physicists call the "north" pole a *north-seeking* pole while others, as Sir William Thomson, call it a *true south* pole. The French and Chinese are consistent; they call it a *south* pole. In magnetic apparatus north-seeking poles are usually coloured red and south seeking poles blue.

We know no more of what is called *magnetic force* than we do of what is called *electric force*. We know only the effects of each, and can perceive their close kinship; and we know so much as that (like electricity), whatever it may be else, it is certainly not a *fluid*. The arguments, which are many, are quite conclusive, and may be found in every text-book. Like electricity, magnetism can suffer insularization, but iron or other paramagnetic substances are alone capable of offering resistance to its passage. Iron filings are readily attracted through a shell of zinc or of paper, &c., by a magnet, but not through a plate of iron or nickel, &c. Cavallo, Bennett, and Coulomb remarked the indications of magnetism given by various substances, as copper, silver, &c. Coulomb formed very fine needles of various substances, and suspending them by silk strings between the opposite poles of two powerful lodestones, found that they

were acted on by the latter. This phenomenon was formerly attributed to the existence of minute quantities of iron or iron compounds in those different bodies, but this is now known to be a mistake. Faraday, in 1845, showed that nearly all substances, even gases, have properties in relation to magnetism; and as regards the phenomena which they exhibit, they are divided into two bodies, *paramagnetics* and *diamagnetics*. To the former class belong iron, nickel, cobalt; also, in a less degree, manganese, chromium, cerium, oxygen gas, and platinum. To the latter, bismuth, phosphorus, antimony, and copper; also, in a less degree, zinc, mercury, water, lead, silver, gold, alcohol, ether, hydrogen gas, air, blood, sulphur, and arsenic. The term *magnetic* is often used as synonymous with *paramagnetic*. The distinction between the two classes is, that a needle or bar of paramagnetic material, when suspended freely between the two poles of an electro-magnet, takes an *axial* position, that is to say, disposes itself in a straight line, joining the two poles; whereas a bar of diamagnetic material takes an *equatorial* position, that is, a position at right angles to the joining line. Again, a body of the former kind, if brought nearer to one pole than the other, is attracted; while a body of the latter class is, in similar circumstances, repelled. The magnetic properties of crystals depend upon their form as well as upon their material, uniaxial crystals having a tendency to place their optical axes in an axial or in an equatorial position, according as the crystals themselves are (in the geometrical sense) positive or negative.

Just as in electricity, the electric force (whatever it may be) is induced on an uncharged body by the presence of an electrical charge, so can the magnetic force be induced on a piece of soft iron by the presence of a magnet. If iron filings be strewn on a piece of soft iron and a magnet brought near, it will at once become magnetic and attract the filings. But even more, the earth's magnetism may be used for the purpose of induction.

If we place a bar of soft iron, suspended by a collection of silk strings at its middle, in a direction parallel to the magnetic axis of the dipping-needle, the action of terrestrial magnetism will have full effect on the bar, its natural magnetism will be decomposed, and it will acquire a polarity similar to that of the needle, its poles repelling the similar poles of the needle and attracting the contrary poles. Even a poker or such object held at the proper declination *and* dip, and smartly tapped once or twice, will acquire temporary magnetic purposes. If the bar be left for a long time in the direction of the magnetic axis, so as to acquire some oxygenation, or if it be heated to a red heat and suddenly cooled by immersion in water, it will acquire a coercive force, and become permanently magnetic. Iron crosses, weathercocks, &c., which have been long kept in a fixed position, or have been struck by lightning, acquire magnetic properties in the manner above described.

It now becomes clear why a magnet attracts iron—namely, it converts it into a magnet, and then attracts it along certain directions in relation to its new poles, which are called *Lines of Force*.

The methods of producing a magnet by induction and by contact have been given in the article *MAGNET*. It remains to notice magnetization by heat and by electricity. If a bar of steel be heated to redness, and cooled while lying in the magnetic meridian of the earth, it becomes magnetically polar. (By magnetic meridian is meant a plane drawn through the zenith and through the magnetic north and south poles of the earth, as determined at that place by a horizontally balanced magnetic needle. The angle between such a meridian and the meridian of longitude is the *DECLINATION* of the place; see that article). No such property is acquired if it cools while lying east and west. Carré produced strong magnets by casting iron in moulds lying in the magnetic meridian and in an intense

magnetic field. Finally, it is found that a strong current of electricity carried through a length of wire coiled round a bar of iron or steel (as in fig. 1) magnetizes it more powerfully than any other method; but in the case of a soft

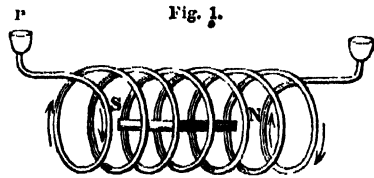
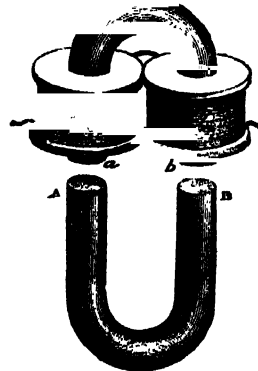


Fig. 1.

iron bar it remains a magnet only so long as the electric current continues. This remarkable property of *electromagnetism* is explained in the article *ELECTRIC LIGHTING*.

The strength of a magnet is measured by the magnetic force it exerts, and the unit of magnetic strength is thus given—"A unit magnetic pole is one of such strength that, when placed at the distance of 1 centimetre from a similar pole of equal strength, it repels it with a force of one dyne." The lifting power of a magnet is not the same as its strength. A horseshoe magnet of the form shown in fig. 2 (in which

Fig. 2.



Electro-Magnet.

*a b* are the poles of the magnet, and *A B* those of its "armature," the bar of soft iron which it attracts) lifts three or four times as much as a bar magnet of the same strength would do, and small magnets lift more in proportion than large ones. Bernoulli's formula for finding the lifting power, *P*, of a magnet whose weight is *w*, is

$$P = a \sqrt{\frac{w}{2}}$$

Here *a* is a constant depending on the goodness of the steel and the method of magnetizing it. In the best steel magnets *a* is between 19 and 23.

Magnetization is found very largely to reside upon the surface of a magnet. Frequently if the outside of a bar is eaten away by acid the magnetization is destroyed. But a thoroughly magnetized bar usually exhibits some force within also.

*Theory of Magnetism.*—The following facts are relied upon by many physicists as warranting a theory of magnetism. A steel bar becomes slightly longer when magnetized than it was before; Joule found it increased by one 720,000th part. A little clink is heard at the moment of magnetization or demagnetization. A tube containing water with iron dust thickly mixed becomes considerably less opaque when magnetized. A twisted iron wire tends to untwist itself. A piece of iron rapidly magnetized and



demagnetized several times grows hot as if suffering friction. On these facts it is considered possible that the molecular result of magnetization is to set the molecules of bodies on end, the long axes pointing in the direction of the bar from pole to pole. Further it is held that the luminiferous ether is capable of such molecular alteration, and it is certain that a ray of polarized light passing through a strong magnetic field has the direction of its vibrations changed—its plane of polarization is rotated. On this theory the production of a magnet by cooling heated iron lying along the magnetic meridian, and the destruction by heating it to redness or by roughly using it, are readily made intelligible. Besides, since every part of a magnet is a magnet, and since all magnets tend to turn north and south, it seems highly probable that all the molecules of a magnet are polarized—i.e. set one way.

**Laws of Magnetic Force.**—These are two: 1. Like poles are mutually repulsive, unlike poles attractive; 2. the force exerted between two magnetic poles is proportional to the product of their strengths, and inversely proportional to the square of the distance between them. Or to use a formula—

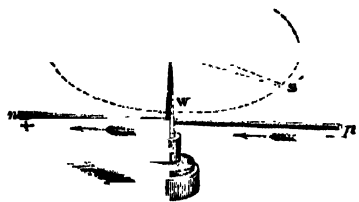
$$f = \frac{m \times m'}{d^2},$$

where  $f$  is the force in dynes,  $m$  and  $m'$  the strengths of the poles, and  $d$  their distance asunder.

The articles DECLINATION, INCLINATION, ISOCONIC and ISOCLINIC lines give all necessary particulars as to the variations in the magnetism of the earth and the consequent variations in the behaviour of the magnetic needle.

The connection between magnetism and electricity was discovered quite at the beginning of the century (1802) by Romagnosi of Trent; but it was not till 1819 that anything definite was known about it. At this date Oerstedt of Copenhagen found that a magnet tends to set itself at right angles to a current of electricity, and that it turns to the right or the left according to the direction of the current. Thus, above and along a magnetic needle mounted on a pivot, hold a wire conveying a current of electricity. Directly contact is made the needle is deflected. If now the wire be held in the same direction, but below the needle, the latter is deflected exactly in the reverse way. Ampère's rule is exceedingly ingenious. Suppose a man to be swimming along the electric current, his face directed towards the needle (whether that be above or below him), then the deflection of the north-seeking pole will always be towards his left hand as it starts from rest. Thus, in fig. 3 the arrows show the direction of the current of electricity from  $p$  to  $n$ ; Ampère's electric swimmer

Fig. 3.



Deflection of Magnetic Needle by Electric Current.

would be floating towards  $n$ , on his back, for the needle is above him.  $N$   $S$  is the position of the needle at rest, and if  $N$   $E$   $S$   $W$  is a circle (seen as an oval by perspective), then the point  $N$  will move towards the swimmer's left, namely, towards  $E$ , and the point  $S$  towards  $W$ , taking up some such position as the dotted line  $N'$   $S'$ . It follows from this that a wire conveying a current has a certain rotatory

action on the field around it. Looking in the direction of the current the "set" round the wire is in the direction of the hands of a watch, as in the figure.

If such a wire pass vertically through a sheet of card carrying a heap of iron filings, directly contact is made and the card tapped smartly, the filings will set themselves concentrically in rings round the axis formed by the wire.

Magnetic force, just as electric force, is expressed in terms of "potential." It is usual to consider that the magnetic potential at any point is the work that must be spent on a north seeking unit magnetic pole in bringing it up to that point from an infinite distance and the potential due to several poles if there are such, is the sum of their separate potentials. The potentials due to south-seeking poles are considered as negative quantities, and bear the minus sign. The difference of magnetic potential between two points is the work to be done on or by a unit north-seeking magnetic pole in moving from one point to the other. Equipotential surfaces are those imaginary shells or surfaces surrounding a pole, over which the potential is equal, and magnetic force always acts across these surfaces, perpendicular to them. As the lines of force deviate by radiation the space round a magnet may be considered as divided up into tubes of force, any section across which will give a constant quantity of lines of force.

Magnetic force is the range of change of magnetic potential per unit of length. Magnetic density is the amount of free magnetism per unit of surface. Magnetic intensity (of field) is measured by the force with which it acts upon a unit magnetic pole, unit intensity being one dyne on a unit pole. There is therefore a field of unit intensity at a centimetre distant from a unit pole. We may express the same things in a tabular form.

$m$ — Strength of mag. pole	$= \sqrt{\text{force} \times \text{sq. of distance.}}$
$V$ — Magnetic potential	$= \text{work} \div \text{strength.}$
$H$ — Intensity of mag. field	$= \text{force} \div \text{strength.}$

It must be added, in conclusion, that while it is admitted that electricity produces magnetism the converse is equally true. For let a magnet be moved into a coil of wire connected with a galvanometer, a momentary current is perceived to flow, then to cease. Withdraw the magnet sharply, and a momentary current flows in the reverse direction and ceases. The latter current is a direct current—i.e. in the direction of such an electric current as would magnetize a piece of iron with the same polarity as the magnet now possesses.

**MAGNETISM, ANIMAL.** See HYPNOTISM, MESMERISM.

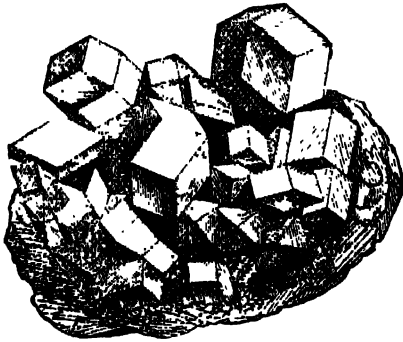
**MAGNETITE** is the richest ore of iron, containing about 72 per cent. of the metal. It is composed of the so-called magnetic oxide iron ( $\text{Fe}_3\text{O}_4$ ), or, as some regard it, is a mixture of the protoxide and sesquioxide of iron ( $\text{FeO}, \text{Fe}_2\text{O}_3$ ). It has a specific gravity of about 5, and hardness of about 6. It crystallizes in the cubic system, the most common form being a regular octahedron, but rhombic dodecahedra also occur. The colour is black and the mineral is brittle; it is highly magnetic, and often exhibits polarity.

This mineral either derives its name from Magnesia, a province in Lydia, or, according to Pliny, from one Magnes, who observed it adhering to the iron of his shoes. When polarized, it is called *lodestone*, and from it the terms magnet and magnetism are derived.

Magnetite occurs widely disseminated as small crystals in many eruptive rocks, also in some metamorphic rocks and fine-grained slates and chlorite schist. On the disintegration and denudation of these rocks it forms a large proportion of the *black sand* found in many rivers, and along the sea-coast in some places. It also occurs in lodes and large masses, mostly in crystalline or highly metamor-

phic rocks, one of the most remarkable deposits being that of Danmora, in Sweden; but it is also found abundantly in Norway, Russia, and many other European localities, as well as in large beds in the United States of America and in Canada. In the British Isles it does not occur in sufficiently large masses to be of commercial importance.

From the high percentage of the metal which magnetite contains, and the general absence of impurity in it—



Crystals of Magnetite or Magnetic Iron.

especially the more injurious, as sulphur and phosphorus — it is one of the most valuable ores of iron, and from it much of the purest iron of commerce is obtained, notably the Swedish iron. The famed Damascus steel was also obtained from magnetite.

**MAGNETO-ELECTRICITY.** See MAGNETISM, ELECTRIC LIGHTING.

**MAGNIROSTRES** is a sub-order of the great order of birds, *PASERES*, distinguished by having the bill large, long, and conical, sometimes slightly notched. This division includes the Chatterers (*Ampelidæ*), Orioles (*Oriolidæ*), Starlings (*Sturnidæ*), Crows (*Corvidæ*), and the Birds of Paradise (*Paradisidæ*). None of this group possess any powers of song, but some among the crows and starlings are mimics.

**MAGNITUDE**, in astronomy, is a eminently chosen term to express the relative brilliancy of stars. It rests on the quite unwarranted assumption that the brighter star is the larger; whereas it is quite as likely that its brightness is the effect of proximity as of size. The most brilliant stars are said to be of "the first magnitude," the next brilliant class are of "the second magnitude," and so on down to the fourteenth or higher numbers; 20,000,000 stars of the first fourteen magnitudes are visible in a powerful telescope, though only 6000 (3000 in each hemisphere) are visible to the naked eye, for it can only see stars down to the sixth magnitude. Of the 20,000,000 just mentioned, nearly 18,000,000 lie in or near the Milky Way, a fact of great significance. The twenty brightest stars, or stars of the first magnitude, are as follows (they may be found in our Plates *CONSTELLATIONS*):—Sirius (Canis Major), Canopus (Argo), Alpha Centauri (Centaur), Arcturus (Boötes), Rigel and Betelgeux (Orion), Capella (Auriga), Vega (Lyra), Procyon (Canis Minor), Achernar (Eridanus), Aldebaran (Taurus), Beta Centauri (Centaurus), Alpha and Beta Crucis (Crux), Antares (Scorpio), Altair (Aquila), Spica (Virgo), Fomalhaut (Piscis Australis), Regulus (Leo), and Pollux (Gemini), but not Castor, which is of second magnitude. These are given in the order of brightness. As far as can be guessed at present, the bright southern hemisphere star, Alpha Centauri, is the nearest of them, and it is now computed to be 20 billions of miles off, so that its light, though so brilliant, has probably taken three and a quarter years to reach us, although it travels 185,000 miles a second; and were it to

perish utterly we should still see it shining for that time after it had vanished from creation. Sirius is held to be 324 times as bright as a star of the sixth magnitude; other stars of the first magnitude vary down to Pollux, which is 100 times as bright as the sixth magnitude. The second magnitude is on the average twenty-five times as bright as the sixth, the third is twelve times, the fourth is six times, the fifth twice as brilliant as the sixth. If, as on the whole seems by far the most probable, nearness and not size is the explanation of astronomical magnitude, then we should consider, basing our calculations upon the known distances of those few stars which can be measured (Sirius, Alpha Centauri, &c.), that light requires on the average fifteen and a half years to reach us from a star of the first magnitude, twenty-eight years from one of the second, forty-three years from one of the third, and so on, till for stars of the twelfth magnitude no less than 3500 years would be required for light to reach us, since they would seem likely to be at least 1000 times as far off as Alpha Centauri and Sirius.

**MAGNOLIA**, a genus of plants, the type of the order *MAGNOLIACEÆ*. The species of *Magnolia* are trees or shrubs, all natives of North America and Asia. *Magnolia grandiflora* (large-flowered magnolia, or laurel bay) is an evergreen tree, reaching sometimes a height of 70 feet. It is one of the tallest and handsomest trees of North America. It has large pale green shining leaves, nearly 10 inches long, with large white flowers. It has been cultivated in England since 1737, and in this country attains a height of from 20 to 30 feet. *Magnolia glauca* (deciduous swamp magnolia) is a native of North America, in low, moist, swampy ground at a little distance from the sea, from Massachusetts to Florida and Louisiana. The bark has a bitter and aromatic odour resembling sassafras. On this account it has been used in America as a substitute for other aromatic bitter barks, as Cascarilla, Cinnamon, &c., and, it is said, with great success. Although not much used in Europe, very favourable reports of its efficacy in chronic rheumatism, ague, and remittent fever have been given. The flowers are of a cream colour and have a sweet scent, which Kalm says may be smelt at a distance of 3 miles. *Magnolia tripetala* is a native of North America, in the Carolinas, Georgia, Virginia, and New York. The wood is soft and spongy. *Magnolia acuminata* is a native of North America, from Pennsylvania to the Carolinas. The fruit is about 3 inches long, and resembles a small cucumber, whence in America it is called Cucumber-tree. A tincture is made of the fruit, and is used in cases of rheumatism. *Magnolia conspicua* grows in China, where it has been cultivated since the year 627. Its native name is Yulan. It is a very showy tree, having white flowers, sometimes suffused with purple, which give out a most delicious perfume. *Magnolia purpurea* (the purple-flowered magnolia) is a native of Japan, and seldom attains a greater height than 8 feet. The bark when bruised has an aromatic odour. The flowers are more or less purple without, and always white within. It is a very ornamental species, and worthy of cultivation. The best situation for it is against a wall, when its branches will reach a height of from 15 to 20 feet. *Magnolia Campbellii* is a native of Sikkim, where it was found by Hooker and Thomson. It is described as the most superb of the genus, attaining a height of 150 feet, with large rose-coloured flowers, which appear before the leaves.

**MAGNOLIACEÆ**, an important order of plants, belonging to the *POLYPETALÆ* (series *Ranales*). The species consist of bushes and trees, inhabiting the temperate parts of both the Old and New World. In England, where they are exotics, they are among the most highly valued of ornamental plants, and every species which can bear the climate, or which will thrive in conservatories, has been collected with great care.

The genera *Talauma* and *Magnolia* have the singular property of dropping their seeds out of the back of the seed vessels when ripe, allowing them to hang down, each suspended by a long extensible elastic cord, composed of delicate spiral vessels.

Besides *MAGNOLIA*, the *TULIP TREE* is well known. The Chinese *ANISE* is a species of *Illicium*.

This order of plants may be known from their allies by the sepals and petals—they are hypogynous, deciduous, imbricate, in three or several series, which are not very distinct; the stamens are numerous; the carpels in a single series, or several on a torus, generally quite distinct; the seeds without an aril (which serves to distinguish them from *Dilleniaceae*), and the albumen not ruminated (as in *Anonaceae*); the embryo is minute. In the tribe *Magnoliaceae* there are large stipules covering the leaves in the bud.

**MAG'GON** or **MAG'O**, a favorite Carthaginian name. The earliest Magón was the father of the great Hasdrubal, and was the first to bring the mercenary armies of Carthage into efficiency (550 to 500 B.C.). Another famous commander held the chief command in Sicily from 396 to 383, and another in 341. One of Hannibal's brothers bore this name also, accompanied him to Italy, and carried the news of Canne to Carthage. Instead of sending Hannibal sue for the Carthaginians, probably through jealousy, despatched Magón to Spain, where, after Hasdrubal had left to endeavour to join Hannibal by land, Magón held chief command. Here he suffered decisive defeat at the hands of the Elder Scipio in 206 B.C., and retired to Minocra, where the town he nourished into prosperity still bears his name as *Port Mahon*. In a last attempt to reach Hannibal, Magón landed near Genoa, but was badly wounded and defeated by Varus when he advanced, 203 B.C. He re-embarked the remains of his army to return to Africa, but he himself died of his wound on the voyage. A Carthaginian writer on agriculture of this name was very highly esteemed at Rome.

**MAG'OT.** See **BABBARRY ARE.**

**MAG'PIE** (*Pica caudata*) is a well-known English bird belonging to the crow family (Covidae). The magpie or pie (the first syllable being an abbreviated form of Madge or Margaret) is widely distributed in the northern parts of both hemispheres. It is remarkable that it did not exist in Ireland some 200 years ago; and from a letter from Swift to Stella, it appears that in 1711, though it had existed for some time in Wexford, it was only then spreading into the rest of Ireland. This bird is so well known that any description is scarcely necessary. The general plumage is pied with black and white, and the tail is long and graduated, beautifully iridescent with blue, purple, and green. The bill is strong, compressed laterally, slightly arched, and hooked at the tip. The wings are short and rounded. The male measures 18 inches; the female is smaller. Scarcely anything in the way of food comes amiss to the magpie; in its general habits it is strongly predaceous, destroying young poultry, game, and other small animals, and even occasionally attacking young lambs and sickly sheep in the same way as the larger crows, whilst, when these delicacies cannot be got, it will satisfy itself with carrion, worms, and insects, and even with fruit and grain. Hence its fondness for the vicinity of human habitations is by no means reciprocated by the occupants of the latter; and in this country, at all events, it is subject to so determined a persecution, that, as Mr. Yarrell observes, "but for its sagacity, eminently evinced in its self-preservation, it would be a rare bird." It is far less common in wooded districts than it used to be, and has become shyer and more suspicious of man.

The magpie usually dwells in woods and plantations, where it builds its nest in a high tree, but sometimes frequents tall hedges, and builds in a thick bush. The

nest, which serves for several seasons, is a domed structure, with an aperture on one side. It is composed of thorny sticks, strongly interlaced, plastered with mud on the inside, and lined with grass and root fibres. The eggs, which are laid early in the spring, are from six to nine in number, and of a pale bluish-green colour, with numerous spots of ash colour and brown. If taken young, the magpie, who, like the family, he becomes very amusing, and exhibits great power of imitating sounds of all kinds. He is, however, the most thievish of all the crows, picking up and concealing any bright object that may fall in his way, although, of course, his hoards of this nature cannot be of the slightest use to him. Various other species of the genus *Pica* are known. The American Magpie (*Pica hudsonica*) is considered by the best authorities identical with the European magpie.

**MAG'PIE MOTH** (*Abraxas grossulariata*) is a well-known British moth belonging to the family Geometridae (LOOPERs) and the subfamily Zereninae. The common name is derived from the magpie-like character of the markings, which vary considerably. The ground colour of the wings is generally white with black patches, which vary in number and intensity of the colour. There is an orange stripe across the middle of the fore wings, and a patch of the same colour at their base. The body is yellow with black spots. The expanse of the wings measures about an inch and a half. The caterpillar is found on the currant and gooseberry bushes, and is very destructive. Its body is cream-colored with black rings and

The caterpillar of an allied species, the Clouded Magpie Moth (*Abraxas almuta*), feeds on the elm.

**MAG'YARS**, the ruling race or race in HUNGARY, are believed to be a people of Turanian origin, who fought their way to the central basin of the Danube, thence extending their conquests from the Carpathian Mountains to Servia, and from the Transylvanian Alps to the Styrian Alps. This invasion is said to have taken place in 889 A.D. They founded a powerful state, governed at first by chiefs of the house of Arpad, and then by kings of the same line. The first of the latter, commonly called St. Stephen, from the renunciation of heathenism by the nation in his reign, received investiture from the Pope, Sylvester II., in the year 1000, with a crown sent for the purpose, which is still extant. The male line of the Arpads failed in 1301,

and was followed by sovereigns of foreign families till 1326, when, by free election, the Austrian house was placed upon the throne. But the Turks invaded and held possession of the greater part of the country for upwards of a century. The Austrian princes became kings of Hungary, subject to certain stipulations ratified by treaty, the violation of which led in 1818 to a gallant but ill-fated struggle for national independence.

The Magyars retain their national language, which belongs to the great Finnic linguistic family, subject to slight modifications owing to long-continued contact with other forms of speech. Its vowels are resolved into two classes, one of which, *a, o, u*, denotes the masculine, and the other, *e, i, ö, ü*, the feminine. The words are formed that a masculine and feminine vowel never meet in the same vocable, whether simple or compound. Another peculiarity is that the Christian name is always mentioned last, as Hunyady János, instead of John Hunyady.

According to the census of 1881, out of 15,520,710 inhabitants of the kingdom of Hungary, 6,165,988 were Magyars—that is, according to the official reckoning. But of these it is believed that fully 1,000,000 were not true Magyars. As a race the Magyars are described as dignified, courteous, and hospitable, but proud, and under the name of patriotism intolerant, and in former times extremely cruel to the subject races. The native dress, so famous for its picturesque quality, though too surely disappear-

ing with civilization, is not extinct even in the capital, where it bursts forth in political crises, causing the streets of Pesth to look for the time being like a series of scenes from an opera.

**MAHABHARATA.** See INDIA.

**MAH'DI**, a name given by Mohammedans to a prophet who is expected to appear before the end of the world, to exalt and purify Islam and to turn the world to Mohammedanism. The expectation of such a deliverer seems to have arisen at a very early period in the history of Islam, and to have been caused, in the first instance, by the disputes which arose concerning the succession to the caliphate. A belief in a hidden, concealed Mahdi or Imaum, who was destined to be subsequently made manifest, formed an essential feature in the teaching of the Persian Abdallah, the founder of the sect of the Ismailians, who flourished in the second century of the Mohammedan era, and since that time the doctrine has been the subject of many modifications and developments in the Mussulman world. There has always been among Mohammedan theologians a great diversity of opinion as to who the hidden Imaum or Mahdi really is, and a still greater amount of uncertainty has always existed as to the date of his reappearance on earth. In the early times of the caliphate the doctrines were evidently invented by conspirators and pretenders for the purpose of gaining the adherence of the ignorant masses, and were modified to suit the exigencies of the moment. The original idea was probably taken from the Jews, who have never lost their hope of a coming Messiah, but the Hebrew conception was transformed by the mysticism of Persia, and at later periods affected by the Christian doctrines of the second advent and of the millennium. Originally a Persian or Shiah doctrine [see IMAUM] it soon spread to the Moslems of other nationalities and denominations, and consequently Mahdis have at different periods appeared in nearly every part of the Mussulman world. Of these perhaps the most celebrated was the veiled prophet of Mokanna, best known to English readers by Moore's poem, whose death took place in the 162nd or 163rd year of the Hegira. In Turkish history there have been several, but none of them obtained much popular support, and they were all arrested and executed without difficulty. The Turks, being naturally realistic and little disposed to religious mysticism, do not readily adopt an idea of this kind, and their traditional devotion to the dynasty of Osman makes them look with suspicion on all sorts of pretenders; but the Persians, Arabs, Berbers, and negro population are more easily led, and from their dislike of the Turks are more ready to accept any one who offers deliverance from the evils which oppress true believers generally. This is especially the case with the Arabs, who regard the Turks as barbarians, and who would willingly free themselves from Turkish domination. In all ages it has been assumed that the Mahdi would have both a political and religious mission—that he would be at once a political deliverer and a religious reformer. During the existence of the caliphate as a great empire the tyrants who were to be overthrown were the Omayyad and Abbaside dynasties, and the deliverer was to be of the disinherited family of Ali, but these original conceptions have in the course of time been considerably modified by external conditions. There are no longer Omayyads and Abbasides, but there are still tyrants in Islam, and Islam as a whole is now threatened by an aggressive Christendom, so that the modern idea of a Mahdi is that of a divinely inspired prophet, whose mission it is to free Islam from external enemies and re-establish purity of faith and practice.

Among modern claimants to the office of Mahdi the most celebrated is Mohammed Ahmed, whose exploits in the Soudan in the years 1881–85 gave the Egyptian and British governments so much trouble. Very little trustworthy information has been published up to the present concern-

ing the life and teaching of this remarkable man, most of the accounts issued being evidently based upon vague native rumours or else the result of fertile imaginations. According to the story of Mousa Penez, a Frenchman born in the Soudan, and who was acquainted with the Mahdi during the early period of his career, Mohammed Ahmed was born at Dongola in 1843 of respectable parents. From his boyhood he was remarkable for religious fervour, and before he was twelve years old he had committed the Koran to memory. His two elder brothers, who were boatbuilders on the White Nile, had him well educated in Mohammedan theology and history, and for this purpose sent him to Khartoum to study under some celebrated professors there. After completing his education he devoted himself to a life of asceticism, gaining a great reputation for holiness by his practices of fasting and meditation. For a long time he remained in seclusion, but when certain of the tribes of the Soudanese, driven to desperation by the cruelty and oppression of the Egyptian governors, had resolved upon revolt, they sent to him for counsel and the aid of his presence. Upon receiving this summons he declared himself Mahdi, and being acknowledged by the Baggas tribe his disciples began preaching all over the Soudan the advent of the prophet, and the coming extermination of the hated Turks. To strengthen his influence he took to himself numerous wives (thirty-nine, according to some accounts) from the families of the most powerful chieftains of the country, keeping within the letter of the Mohammedan law, which only allows four, by a system of temporary divorce. The whole of the Soudan was ripe for revolt, and in a very short time he found himself at the head of several enthusiastic and warlike tribes of Arabs. To them he declared his mission to restore and purify Islam, and he at once began to insist upon the strict observance of all the precepts of Mohammedan law, and to enforce the prescribed devotional exercises with considerable rigour. He commanded his followers to abstain, not only from wine and spirituous liquors, but also from coffee and tobacco, forbade all luxury and effeminacy, announced himself to be the champion of the poor, and declared his intention of introducing a kind of socialistic equality among all true believers. It is said that when he captured El Obeid he issued an edict forbidding his followers to live in houses, and after the Bedouins had wrecked the houses of the inhabitants, the whole population were obliged to construct huts of straw in the courtyards of their dwellings, and either live in them or at least keep up the appearance of doing so. He promised relief from all the oppressive exactions of the Egyptian governors, but demanded a small tax from his followers for the support of the fighting men, and arranged to secure a due proportion of the plunder taken for the same purpose. At the outset of his career he was patronized by some powerful slave-merchants for their own purposes, but he soon grew too strong to need their patronage, and by his skilful management gained the enthusiastic support of his followers.

An account of his victories over the Egyptian forces has already been given in the article on EGYPT. In the beginning of 1885 the town of Khartoum, which had been bravely defended by General Gordon for about twelve months, fell into the hands of the Mahdi, Gordon being killed in the assault; but soon after this event a rival Mahdi appeared, and Mohammed Ahmed was compelled to turn back from his triumphant advance towards Egypt. The further development of his career was cut short by his death, which took place after a short illness in the month of June, 1885. In the unhesitating faith and fanatic valour of the followers of the Mahdi we have a modern illustration of the spirit which in the early days of Mohammedanism carried the Arabs on their victorious career. Even now, although civilization is no longer endangered, should a revolt such as this spread to Arabia

and North Africa. European interests would for a time be very seriously affected. An excellent brief account of Mahdism is contained in "The Mahdi, Past and Present," by James Darmesteter (London, 1885).

**MAHMUD'** of Ghazni, celebrated in history as the first Mohammedan invader of India, was born 2nd October, 971 A.D. His father, originally a Turki slave, had by his great abilities as a soldier been raised to the position of ruler of Ghazni, and though at his death he named his son i-mail to be his successor, the latter was conquered by his younger brother Mahmud, who obtained undisputed power as sovereign of Khorasan and Ghazni in 997. He was confirmed in the possession of his authority by the Caliph of Bagdad, and he is said to have resolved on an annual expedition against the idolators of India. He started on the first of these in the year 1000 A.D., and though he did not lead a fresh expedition every year, his invasions were so numerous and successful as to enable him to reduce the Punjab to the position of a dependency, and to enrich his treasury to an enormous extent by the booty carried off. He was a determined idol-breaker, and he made the Hindu temples special objects of attack. The story of his refusing a heavy ransom for a celebrated idol, and after breaking in its face with his battle-axe being rewarded by a shower of jewels which had been hidden in the hollow head of the image, is well known. He was a brave and skilful soldier and an earnest champion of Islam, but his love of plunder seems to have also had something to do with his repeated invasions of India. He was not merely a soldier, however, for he erected some magnificent buildings in his capital, and carried out important public works. He was also a liberal patron of learning and literature, and his court became the home of several celebrated Arabic poets and historians. Among the most famous of these was the poet Firdusi, and it was at the request of Mahmud that Firdusi undertook the composition of the "Shahnamah" (the Epic of kings). His connection with the poet, however, was rather unfortunate for both parties, as we have already noticed in the history of Firdusi. Mahmud died at Ghazni in 1030, in the sixty-first year of his age and thirty-third of his reign, and his tomb is still shown in a garden a short distance from that city.

**MAHMUD II.** Sultan of Turkey, the younger son of Abdul Hamid or Ahmed IV., was born on the 14th of Ramazan A.H. 1199 (20th July, 1785). In 1808 he deposed his elder brother Mustapha, and secured his position by ordering him to be strangled together with his infant son, and by drowning in the Bosphorus all of Mustapha's wives who promised to furnish heirs to the throne. By these murders Mahmud became the only male descendant of Osman, which was a matter of great importance, the popular belief being that Turkey would last no longer than the family by whose great ancestor the empire was founded. The war with Russia was then prosecuted vigorously, but Turkey was compelled by exhaustion to make peace on 28th May, 1812. Mahmud then set himself to subjugate the semi-independent pashas of the outlying provinces, and to carry out internal reforms. The rebellion of the Wahabis was crushed in 1818 by Ibrahim Pasha, and Ali Pasha was overthrown and killed in 1822, but in 1821 Greece revolted and another contest with Russia was commenced. The independence of Greece was secured by the defeat of the Turko-Egyptian fleet at Navarino by the combined British, French, and Russian fleets. In 1827, though its existence as a separate kingdom was not recognized by Turkey until 1830. During the progress of the Greek revolution Mahmud had to suppress a rebellion on the part of the janissaries, and after causing about 6000 of them to be slaughtered he broke up and exiled this formidable force. His next war was with Mehemet Ali, who had raised an insurrection in Egypt, and he was only saved from overthrow by the intervention of

Russia, by whom peace was enforced in 1833. Still determined upon effecting the changes he considered necessary for the reorganization of Turkey, he modified and rearranged the system of taxation, formed a militia, and established schools for some branches of Western knowledge. At the same time he prepared for making war anew upon Mehemet Ali, and the conflict commenced in 1839. Mahmud died 1st July, 1839, a few days before the news arrived of the defeat of his forces by Ibrahim Pasha, son of Mehemet Ali, on 24th June. He was a sovereign of great sagacity, energy, and resolution, and under happier circumstances might have done for Turkey what Peter the Great did for Russia.

**MAHOG'ANY**, a beautiful species of cabinet wood, so called from *Mahogani*, the American name of the tree *Swietenia Mahogani*, which belongs to the order MELIACEÆ. It is a native chiefly of the Bay of Honduras, whence it is largely exported to this country. It is also exported from Cuba, Jamaica, Hispaniola, and South America generally. The tree is straight and tall in its growth. It is about 4 feet in diameter, and sometimes rises 60 feet from the spur to the limb. Its foliage is of a beautiful deep green, the flower of a reddish or saffron colour, and the fruit as large as a turkey's egg. Some of these trees grow to a height of 100 feet. The wood is usually hard, takes a fine polish, and is much used in all kinds of cabinet-work. The first appropriation of this valuable wood in England possesses some historical interest. At the end of the last century, a physician, Dr. Gibbons, had a brother, a West Indian captain, who brought over some planks of this wood as ballast. Mrs. Gibbons wanted a candle-box; the doctor called on his cabinetmaker, Woollaston, in Long Acre, to make him one of this wood. Woollaston complained that it was too hard. The doctor said he must get stronger tools. The candle-box was made, and approved, inasmuch that the doctor then insisted on having a bureau made of the same wood, when the fine colour and polish were so pleasing that he invited all his friends to come and see it, among them the Duchess of Buckingham. Her Grace begged some of the wood from Dr. Gibbons, and employed Woollaston to make her a bureau also, and this contributed to the fame of mahogany, which soon came into general use.

Mahogany has neither taste nor smell, shrinks very little, and warps or twists less than any other species of timber. It is very durable when kept dry, but does not last long when exposed to the weather. It is not attacked by worms. Like the pine tribe, the timber is best on dry rocky soils or in exposed situations. Part of that procured from Honduras grows upon moist low land, and is, generally speaking, decidedly inferior to that brought from Cuba and Hayti, being soft, coarse, and spongy, while the other is close-grained and hard, of a darker colour, and sometimes strongly figured.

**MAHOM'ET** (the prophet of Islam). See MOHAMMED.  
**MAHOM'ET** was the name of two famous sultans of the Ottoman Turks.

**MAHOMET I.** was the restorer of the Ottoman Empire, which he found in a state of anarchy after the fall of Bayazid, the first who was styled *sultan* (i.e. civil head of Islam) by the Caliph. He extended his conquests into Europe, and obliged the princes of Bosnia, Servia, and Wallachia to pay him tribute. He died, after nine years' reign, in 1421.

**MAHOMET II.**, son of Murad (or Amrath) II., and grandson of Mahomet I., was proclaimed emperor of the Ottomans after the voluntary abdication of his father in 1444; Murad, however, was obliged to resume the reins of government till his death, in 1451, when Mahomet commenced his reign. He prosecuted many successful wars in Europe, taking Constantinople (1453), Corinth (1458), Tielbazid (1461), Negropont (1470), and Otranto (1480), by storm; he, however, met with some reverses at Belgrade (1456) and Rhodes (1480). He died in Bithynia

in 1481. His epitaph runs thus:—"I designed to conquer Rhodes and subdue proud Italy."

Of all the later rulers of Islam this is the greatest, the purest typical example of an Ottoman Turk. Murad had drawn down the dominions of the Greek Empire (still calling itself the "Roman Empire," as it had done since Constantine removed the seat of empire to Byzantium, the "New Rome") to very little more than a strip round Constantinople or Byzantium, a patch at Trebizond, and a few tracts in the Peloponnese. Mahomet II. deprived Europe of these last relics of a great monarchy in 1453. In that year Constantinople passed out of civilization into barbarism, and it seems impossible to predict when it shall again be free. To cover the barbarism with a thin veneer of Western manners, as we do in later years, is futile. The Turk is almost the same now as when Mahomet II. first settled him in Europe. He occupies a fortified encampment on part of our European territory, among us, yet not of us. The man who did this, who took Justinian's famous Church of the Holy Wisdom (Santa Sophia) and turned it into a mosque, such as it still remains, was the most faithless, the most lustful, and most cruel even among Ottomans. He it was who fixed, almost with the firmness of a law, the barbarous custom, faithfully observed from his day to ours, of the murder (or imprisonment and ruin by compulsory debauchery) of all possible candidates to the throne by each sultan at his accession. He it was who, having sworn not to harm the head of the governor of Itholia if he surrendered, carried out his promise by sawing him asunder in the middle. At the same time he was the greatest soldier, the greatest statesman (if one dare use such a word of a Turk), and the nearest approach to a patron of art and literature, in short the most favourable specimen of the fullest development of the Ottoman race. The Ottoman Empire as a state is practically the creation of Mahomet II. Even its territorial limits were fixed by him. Trebizond, the outlying Greek "Empire," fell to him in 1461, completing the conquest of Asia Minor: this was just after Scanderbeg had died (in 1469), and the Greek peninsula had wholly passed into the conqueror's hands. Montenegro alone, of all that fair Greece which we have been taught to call Turkey, remained, and has ever since remained, free. Falling at Rhodes, Mahomet crossed to the Italian peninsula, and began a fresh series of conquests with Ottanto. Happily death checked him, and Ottanto was regained from his son and successor's less mighty hands.

**MAHRATTAS.** See MAHARATAS.

**MAIA** was the eldest and most beautiful of the Pleiads, daughters of Atlas and Pleione. By Zeus, who was enamoured of her, she became the mother of Hermes (Mercury). The Pleiads rise in Italy and Greece about the beginning of May, whence possibly the name of the month.

**MAID'EN.** The name of an instrument of capital punishment formerly used at Halifax in Yorkshire, and in Scotland. It was the prototype of the French guillotine, and consisted of a loaded piece of iron with a sharp edge, which moved in grooves in a frame 10 feet high. This piece, being raised to the top of the frame and let loose, descended and severed the criminal's head from his body.

**MAIDEN-HAIR FERN.** See ADIANTUM.

**MAID'ENHEAD,** a municipal town of England, in the county of Berks, situated near the Thames, 24 miles from London on the Great Western Railway, amidst beautiful scenery. It consists chiefly of one street extending from the river about a mile along the old highroad to Oxford, and lined with numerous respectable and handsome houses. The town contains a town-hall, a hall for meetings, and places of worship for various denominations. There is a handsome stone bridge over the Thames for the main road, and another about 500 yards south

for the Great Western Railway, which skirts the town in its whole extent. There are no manufactures, but the town has, nevertheless, a prosperous appearance, and is in the centre of an opulent neighbourhood—the beauty of the scenery and the railway facilities having made it a favourite place of abode with persons engaged in business in London, as well as with others of independent incomes. It is a great thoroughfare, in consequence of which there are several inns. Maidenhead has a corporation, consisting of a mayor, four aldermen, and twelve councillors. The population in 1881 was 8220. The name is sometimes said to be derived from the head of one of the Eleven Thousand Virgins having been preserved here, but is really merely corrupted from Maiden- (or Midden-) hythe, from its timber wharf, which existed here before the highroad ran through it. The place was formerly called Midan or Midden Hythe, then Maidenhythe, from which again its present name is a corruption. The town was first incorporated into a guild 26 Edward III.; a chapel dedicated to St. Andrew and St. Mary Magdalen had been already erected. At Maidenhead Charles I. was allowed by the Parliament to see his children, after several years' separation, 16th July, 1647.

**MAIDS OF HONOUR.** Anne, daughter of Francis II., duke of Brittany, and queen of Charles VIII. and Louis XII. of France, was the first to have young and beautiful ladies about her called maids of honour. The present Queen of England has eight. They are her immediate attendants, and it is their duty, in rotation, to accompany her on all occasions. They generally have a title in their own right, but whenever this is not the case they are by courtesy styled the "Honourable Miss —," without the Christian name.

**MAIDSTONE,** a town of England, in the county of Kent, 13 miles from London by the South-eastern Railway. It is a municipal and parliamentary borough, is the assize town of the county, and is situated on a declivity on the east bank of the Medway. The town is in a pleasant position in the central vale of Kent, has a fine parish church, founded at the end of the fourteenth century, and known as the "Pilgrim's Chapel," and many almshouses and charities. The public buildings are numerous, embracing, besides a former palace of the archbishops of Canterbury, a town and county hall, gaol, and lunatic asylum, barracks, theatre, library, philosophical society, an excellent museum, assembly rooms, mechanics' institute, West Kent Infirmary and Hospital, the County Ophthalmic Hospital, &c. A building for the Grammar School was opened in 1872, and a bridge of three arches over the river was finished in 1879. In the vicinity are paper and oil mills, and some of the most productive hop grounds and orchards in England; also valuable quarries of stone, which is exported by the Medway. Trade is thriving, and the town increasing. Some public gardens, which had been purchased and beautified by Mr. Julius Brenchley, at a cost of over £20,000, were opened in 1873. There was an important city of the early Britons in the neighbourhood of this town. In the reign of Henry VIII. the first English hops were raised here. Maidstone, spelled in Saxon times *Medrecestun*, received its charter of incorporation from Edward VI. in 1549, but forfeited it in the following reign, owing to the connection of its inhabitants with the insurrection of Sir Thomas Wyatt. Queen Elizabeth granted another charter, with increased privileges; but this also became void, by a *quo warranto*, soon after the Revolution of 1688; and a new charter was granted in 1748 by George II. The municipal borough is divided into four wards, and is governed by six aldermen and eighteen councillors. The population in 1881 was 29,638. The parliamentary borough at the same time had a population of 39,662. It formerly returned two members to the House of Commons, but was deprived of one by the Redistribution of Seats Act passed in 1885.

**MAIGRE** (*Sciæna aquila*), a fish belonging to the family Scienidae, the order Acanthopterygii, is sometimes caught on British coasts. It has a very wide range, being common in the Mediterranean and extending to Australia and the Cape of Good Hope. The maigre is a large fish, being usually 3 feet long, and sometimes attaining a length of 6 feet. The body is thick and elongated, greenish-brown above and bluish-white below; the head is short and rounded, and the mouth is not provided with barbels. The soft dorsal fin is much more developed than either the spinous dorsal or the anal. The ventral fins are pectoral, with one spine and five soft rays. The air bladder is curiously fringed.

The flesh of the maigre, though dry, is considered good and wholesome. Formerly the head was greatly esteemed by epicures, and in the fifteenth and sixteenth centuries it was the custom to present it as a valuable gift to the three conservators of the city of Rome.

**MAIL** (from the French *maille*), strictly "the mesh of a net," but applied in a collective view to defensive armour formed of iron rings or round meshes. Boyer, in his French dictionary, translates *maille* "a little iron ring;" but later on a coat of mail (also denominated the *hauberk* or *haubergeon*) came to mean any armour for the body, whether chain-mail or plate mail. See ARMOUR.

**MAIMONIDES**, or **MOSES BEN MAIMON** (Moses the son of Maimon), called by the Jews *RaMBaM*, from the initials of the latter name with the title Rabbi prefixed, the greatest theologian and scholar the Jews ever produced, was born at Cordova, 30th March, 1135. His ancestors for six generations had been distinguished for learning, and his father, Maimon, was the author of several important works in Arabic and Hebrew. The father, owing to the persecutions of Caliph Abdul Mumen, who became master of Cordova in 1148, was obliged to remove with his family to Fez, where he made an external profession of Mohammedanism for the sake of peace, but kept up at the same time the domestic observance of Judaism. He maintained this for sixteen years, hoping for a larger measure of public liberty, but at last, finding the new caliph as bigoted as the old, he resolved to emigrate, and accordingly embarked with his family for Acre, from whence he passed to Jerusalem, where he died. On his father's death Maimonides removed to Cairo, where, as he shared the feeling common to most of the Jewish rabbis, that religious learning should never be made a means of gaining bread, he supported himself by dealing in jewels, and afterwards by the practice of medicine. In the latter he gained so great a reputation that, in spite of his race and religion, he was made court physician to Saladin of Egypt. His attainments in learning had by this time become so famous that young Jewish students flocked from all parts to listen to his lectures in the rabbinical college of Cairo, and he was frequently consulted by congregations and rabbis on questions of difficulty in matters pertaining to the law. Nor was this fame unmerited, for it is evident from his writings that he had not only studied the Bible and Talmud profoundly, but had made himself master of the whole extent of Arabian science, and of Greek philosophy also, as far as it had been made accessible by Arabic translations. He was the author of numerous works on astronomy, mathematics, and medicine in Arabic, which were highly esteemed by Arabian scholars; but his greatest works, and those on which his fame and influence have been chiefly based, were in connection with theology and philosophy. Among these the most important are his "Commentary on the Mishnah," written in Arabic, begun in Fez in 1158 and finished ten years afterwards in Cairo. This work forms an elaborate historical introduction to the oral law, and it traces its development, its divisions, plan, &c., in so masterly a manner that it was soon regarded as being an essential part of the Talmud itself, and no edition is considered complete without it.

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This was followed by the "Sepher Hammisvoth," or Book of the Precepts, an exact enumeration of the 613 Biblical precepts recognized by the rabbis, together with thirteen articles of belief, which every Jew, in the opinion of Maimonides, is bound to hold and confess, and which were afterwards included in the synagogue ritual. This book, however, was merely a preliminary to the author's masterpiece, entitled the "Mishneh Torah," a gigantic work, containing a systematic codification of the whole Jewish law as it is to be found in the Bible and in the Talmud. It was written in Hebrew, was divided into fourteen books, and it comprises 982 chapters. The first book, which sets forth the duties of knowledge, and is chiefly theological, is prized by Jewish rabbis as of inestimable worth. Next to this work in importance, and quite equal to it in interest, was the "Guide of the Perplexed," written in Arabic and designed to reconcile Jewish theology with refined Greek philosophy. This work, while it contributed more than any other to the rational development of Judaism, became, immediately after the author's death, the centre of a fierce controversy among the Jews, which raged with the most bitter intensity for over a century, and the echoes of which have hardly yet died away.

Maimonides died at Cairo, 13th December, 1204, so that he did not quite attain to the age of seventy. In his own time he was styled the "Light of the Age," and he has since been recognized not only as one of the greatest scholars of Judaism, but also as one of the noblest and grandest thinkers of all time. Notwithstanding the immense progress made in learning since his day his works are still studied with interest by European scholars, and a fine edition of his "Guide" was published in Paris, in Arabic and French, in 1856-66. The estimate formed of his character by his countrymen may be gathered from the saying current among them—"From Moses till Moses appeared no second Moses."

**MAIN**, a navigable river of Germany, rising from two sources—the Red and the White Main—in the Fichtelgebirge, North Bavaria, Germany. Its two streams unite in the circle of Upper Danube, and then it flows west, with many windings, into the territory of Hesse, through a rich vine country, joining the Rhine opposite Mainz. It is navigable 240 miles from the Rhine. It receives on the left bank the Regnitz and Tauber, on the right bank the Saale and Nidda. Length, 280 miles.

**MAIN PLOT** and **BYE PLOT**, or "Surprising Treason," were two closely connected enterprises. The Main Plot was arranged for the purpose of seizing the person of King James I., and placing Arabella Stuart on the throne, and was led by Sir Walter Raleigh, Lord Cobham, Lord Grey, and other conspirators, aided by Spanish influence and money, in the summer of 1603, immediately after James' accession. The plots were discovered (the Bye Plot was much the same, except that it omitted the design in favour of Arabella Stuart), and Raleigh was arrested with all the rest, July, 1603. The conspirators were tried and condemned at Winchester in November: two Catholic priests, Watson and Clarke, were hanged; Brooke, brother of Cobham, and the only one in both plots, was beheaded on 5th December; Cobham, Grey, and Sir Griffin Markham were reprieved on the very scaffold, 9th December, and Raleigh languished out his life in prison till 30th January, 1616, when he was released. [For his subsequent fate see the article RALEIGH.] His guilt as to the Main Plot rested on the evidence of Cobham alone, and there are good reasons for believing him innocent.

**MAINE** is the most north-easterly of the United States of North America. It is bounded S.W. and W. by New Hampshire, S. by the Atlantic Ocean, E. by New Brunswick, and N. and N.W. by Canada. The southern boundary of Canada, which had long been in dispute between the United States and Great Britain, was definitively settled

in 1846. The area is 31,766 square miles, and the population in 1880 was 648,945.

*Surface and Soil.*—The coast-line of Maine is indented by numerous bays, of which the principal are—Casco Bay, Penobscot Bay, Frenchman's Bay, Machias Bay, and Passamaquoddy Bay. These bays contain a great number of small islands, about 400 altogether, and some of considerable size; such as Mount Desert, in Frenchman's Bay, and LONG ISLAND, Fox Island, and Deer Island, in Penobscot Bay. Though the frost along this shore is very intense in winter, and the numerous islands favour the formation of ice, the harbours are commonly open all the year round, the strength of the tide, which rises to between 24 and 40 feet, preventing their being closed up. Indeed Maine has more good harbours than any other state in the Union. The country rises gradually, but rather rapidly, from the shore. The surface of the state is mostly hilly, but it is only in the north-western and northern districts that the hills rise to the height of mountains, of which the highest, Mount Katahdin, rises to 5385 feet. This mountainous district occupies more than one-fifth of the area of the state.

The centre of the state is occupied by a hilly region, which is well drained by numerous rivers with a rapid course. The southern portion is level and marshy. Along the sea-coast, and from 10 to 20 miles inland, the soil is of moderate fertility, and frequently intersected with sandy and sterile tracts; but beyond this region the soil improves considerably, and produces plentiful crops of grain, flax, and hemp.

*Rivers.*—The rivers in the southern district have a short course. The principal are the Piscataqua, the Saco, and the Presumpscot or Casco. East of Casco Bay is a deep indentation which receives two considerable rivers, the Androscoggin and the Kennebec. The Androscoggin rises about 45° 12' N. lat., 71° 15' W. lon., and flowing south and west, and again south and west, after a course of about 200 miles, joins the Kennebec near its mouth in Kennebec Bay. The Kennebec rises in several branches on the eastern declivity of the mountain-range which separates Maine from Canada; these branches unite in Mooseland Lake, a sheet of water about 80 miles long from north to south, with a breadth varying from 5 to 20 miles. From this lake the Kennebec issues in a large stream, and the general direction of the remainder of its course is to the south, till it reaches the mouth of the Androscoggin, after a course of about 250 miles. Though its course is obstructed by falls and shoals, like that of the Androscoggin, it is of great importance in the transportation of lumber. The tide ascends to Augusta, 70 miles from the open sea. The Penobscot falls into Penobscot Bay, has a course of about 250 miles, and is navigable for large ships to Bangor, 62 miles from the sea. The St. Croix or Scodie, which separates Maine from New Brunswick, enters Passamaquoddy Bay after a course of about 100 miles. Lakes and ponds in the interior are very numerous, especially in the north.

*Climate.*—The winter is very severe. From the 1st of November to the 1st of April the ground is covered with snow, and the rivers and lakes with ice. The summer on the sea-shore is very hot: the thermometer frequently rises to 90°, and even 96°, and the weather is subject to sudden and great changes. Drought is frequent, but the country generally is healthy.

*Productions, &c.*—The principal products of this state are maize, wheat, barley, rye, and flax, with pine and other timber; apples, cherries, &c. The minerals comprise marble, iron ore, and lead. The annual value of the cotton manufactures has been estimated at 2,500,000 dollars. Shipbuilding is also extensively carried on—one third of all the ships of America being built on its rivers and harbours.

Maine has some good canals, and fair railway communication. The legislation of Maine is remarkable as containing the enactments known as the Maine Liquor Laws, to prohibit the sale of intoxicating beverages, except cider, by any but the constituted authorities for the purposes of medicine, mechanics, or manufacture. The law was passed in 1851, and whatever doubts there may be as to the wisdom of the policy on general grounds, it cannot be denied that they have greatly decreased, though they have not by any means stopped, drunkenness.

Maine seems to have been discovered by one of the Cabots in 1497. It was afterwards visited by the French, who called the southern part, west of the Kennebec, *Maine*, and the eastern part *Acadie*. The English made some settlements in the southern district about 1635. The first charter was proprietary, and granted in 1639 to Sir Ferdinand Gorges, but in 1652 Maine was united to Massachusetts, under the title of the county of Yorkshire. Massachusetts, in 1819, gave permission to the freemen of Maine to decide the question of a separation, when, the majority of votes being in favour of it, it became an independent state. In its early history it is said that every twentieth settler was killed by the Indians.

**MAINE, LE**, one of the old provinces of France, was bounded N. by Normandie, E. by Orléanais, S. by Anjou or Touraine, and W. by Bretagne. It now forms the greater part of the departments MAYENNE and SARTHE, and part of ORNE.

**MAINE-ET-LOIRE**, a department in France, formed out of the old province of Anjou, and named from its two principal rivers, the Maine and the Loire, is bounded N. by the departments of Mayenne and Sarthe, E. by Indre-et-Loire, S. by the departments of Vienne, Deux-Sèvres, and Vendée, and W. by Loire-Inférieure. Its greatest length is 77 miles, its greatest breadth 60 miles. The area is 2750 square miles: the population in 1886 was 527,680.

*Surface.*—The department presents a pleasing variety of low hills, mostly planted with vines, and of plains, which are very fertile. The fields are inclosed by ditches and quickset hedges, within which clumps of trees are planted here and there, the whole giving a warm and agreeable aspect to the country.

*Rivers.*—The department belongs entirely to the basin of the Loire, which river crosses it from E. to W., and forms in its course several beautiful islands. The northern districts are drained by the Mayenne and its feeder the Oudon, by the Sarthe and its feeder the Loire, and by the Authion. The Mayenne and the Sarthe unite above Angers, and form the Maine, which after a course of about 5 miles falls into the Loire south by west of Angers. These last-named rivers are navigable; the Loire steamers between Nantes and Tours ply up the Maine as far as Angers. The chief feeders of the Loire from the left bank in this department are the Thouet and the Layon. The Sèvre-Nantaise, and its tributary the Moine, drain a small portion of the south-west of the department. The department is traversed by the Orléans-Nantes Railway. The climate is healthy, and the temperature mild; winter is rainy; west and south-west winds prevail.

*Soil, Products, &c.*—The soil is generally fertile, yielding corn more than enough for the consumption. The chief crops are wheat, rye, barley, and pulse of all kinds. Other valuable products are hemp, flax, nuts, excellent fruits, &c. About 15,000,000 gallons of white and red wine are made annually, some of which is of good quality. A considerable quantity of effervescing wine, resembling the true champagne and rivaling it in quality, is manufactured. The department is famous for its melons. A considerable quantity of cider is also made. The forests, which are extensive, consist chiefly of oak and beech. The pasturage is good, and great numbers of horses, mules, horned cattle, and sheep are reared. Deer and wild bears are met with in the forests;



wolves and badgers are sometimes seen; foxes, weasels, and wild cats are more common. Feathered game is very abundant. Fish is plentiful; the rivers are infested by otters. Among the reptiles are vipers, adders, the common snake, and land-lizards.

The minerals worked comprise slate, granite, marble, and flint. The quarries of the former, especially those of Angers, are vast excavations, worked right from the surface of the ground. The principal manufactures carried on are linens, challels, ginghams, and calicoes. Grain is extensively exported. The department is divided into the five arrondissements—Angers, Baugé, Segré, Cholet, and Saumur. The capital of the department is **ANGERS**.

**MAINTENON, FRANÇOISE D'AUBIGNÉ, MARQUISE DE**, the second wife of Louis XIV., was born in a prison at Niort on 27th November, 1635, where her father had been imprisoned as a Huguenot. In 1639 he was released, and emigrated with his family to Martinique, where he died in 1645. Madame d'Aubigné returned to France, and died there in 1650, after suffering much from poverty, leaving her daughter absolutely penniless. In this condition Mademoiselle d'Aubigné was befriended by the poet Scarron, who offered either to pay for her admission to a convent, or, though he was deformed and an invalid, to make her his wife. She accepted the latter offer, and became Madame Scarron in 1651. To the poet she was a kind and attentive wife, and her beauty and intelligence enabled her to take a prominent position in the midst of the refined and intellectual society which frequented his house. After his death in 1660, she enjoyed his pension for a few years; but it was stopped in 1666, and she was preparing to start for Portugal, to become lady-attendant to the queen, when she made the acquaintance of the king's mistress, Madame de Montespan, who obtained for her the renewal of the pension and induced her to stay in Paris. She was afterwards intrusted with the education and care of the children which Madame de Montespan had borne to Louis XIV., a task which she carried out with unremitting kindness and devotion for several years. Out of her savings she purchased the estate of Maintenon, and when she removed with the children to court she so gained the favour of the king that he raised her estate to a marquiseate. Ultimately she displaced Madame de Montespan herself, and after the death of the queen, although she had reached the age of fifty, she was, in 1685, secretly married to Louis. For thirty years she retained his respect and affection, and though she was never publicly acknowledged as queen, she exercised much authority in national affairs. She enjoyed also a great reputation for devotion, and her influence at court was always exercised on the side of decency and morality. One of the best of her acts was the founding of a school for poor girls, which afterwards grew into the splendid institution of St. Cyr, and she always showed herself a kind friend and patron of her pupils. After the death of the king she retired to St. Cyr, where she remained in seclusion until her death, which took place 15th April, 1719. Her political influence was disastrous to her country. The later years of Louis XIV. were filled with failures and reverses. The Jesuit party rose under her favour to great authority, and it is to her we must ascribe the revocation of the Edict of Nantes, which directly and indirectly brought such evil to France. Nevertheless, it seems certain that she opposed the abominable persecution of the DRAGONADES. Her letters have been frequently published, the best edition being that of Théophile Lavallée (1854).

**MAINZ, MENTZ, or MAYENCE**, the Roman *Moguntiacum*, is a fortified city of West Germany, in the grand-duchy of Hesse-Darmstadt, on the left bank of the Rhine, a little below the junction of the Main with that river, on the slope of a hill. The population in 1881 was 60,905. Mainz is connected by a modern bridge and a railway from

bridge over the Rhine, with the village of Kastel or Kassel, included in its system of fortifications, which render it one of the strongest and most important fortresses in Germany. Besides the ramparts, the city is defended by extensive outworks, comprising a citadel, six forts, and a strongly fortified island on the river. The old streets are for the most part narrow and crooked, but a number of handsome buildings and new streets have sprung up, while ample space for an immense extension of the town has been afforded by the widening of the line of circumvallation. Along the Rhine extends a handsome quay. Of the squares, the principal is the Parade, which is surrounded with avenues of trees. Of the eleven churches, of which one is for Protestants, the most remarkable are the cathedral, a vast building, surmounted by a lofty cupola; the Church of St. Ignatius, which is considered a model of beautiful ecclesiastical architecture; St. Peter's; and St. Stephen's. Under St. Boniface, the apostle of Central Germany, the see was raised to an archbishopric and made the seat of the primate of Germany. This prelate was the son of an English wheelwright, and he assumed a pair of wheels as his armorial bearings, which are retained to this day in the arms of the city. The other chief buildings are the grand-ducal palace, the arsenal, the palaces of the commandant and of the vice-governor, the episcopal palace, the theatre, &c. A bronze statue of Gutenberg (the inventor of printing, and a native of Mainz), modelled by Thorwaldsen, and cast in Paris, was erected in an open space opposite the theatre in 1837. A literary club now occupies the site of his house. A gymnasium has taken the place of the former university, and there are several schools. The city library consists of above 130,000 volumes—among which are some of the earliest extant specimens of printing—and in the same building there are extensive collections of Roman antiquities, medals, &c. The Eichelstein in the citadel is supposed to be a monument in honour of Drusus Germanicus, brother of the Emperor Tiberius. The environs are very beautiful, and the prospects over the surrounding country magnificent. Mainz is a free port; it has few manufactures, but the commerce is considerable. Steamers ply regularly to the chief towns on the Rhine. Two railways run from the city, one east to Frankfurt, the other north to Wiesbaden. The town was taken by the French in 1797, but ceded to Hesse-Darmstadt in 1815. Prior to 1866 the garrison was composed of Austrian and Prussian troops in equal proportions, and the military governor was alternately a Prussian and Austrian general. In 1870 it was declared an imperial city.

**MAIRE DU PALAIS**, or *Mayor of the Palace*, the head of the executive power under the later Karling kings of France. See **FRANCE**.

**MAISTRE, JOSEPH, COMTE DE**, the famous French author, was of noble Savoyard family, and was born at Chambéry in 1753. He took civil service in the duchy of Languedoc, retiring at the Revolution to Lausanne. When Switzerland was attacked he wrote his first important work, "*Considérations sur la France*." At this time he acted as minister at Turin to the King of Sardinia in his restricted territory. When Piedmont fell before the young Napoleon, De Maistre retired to Sardinia; and at the beginning of the present century he was sent to St. Petersburg to plead the cause of his master. There he remained till 1815, and wrote his great works, "*Du Pape*," "*De l'Eglise Gallicane*," and "*Les Soirées de St. Petersburg*," the latter remaining unfinished. De Maistre is an uncompromising Ultramontane, declaring the Pope to be the source of all authority on earth; at the same time in all points, except those of faith, he admits considerable liberty. His plan of society is rigorously logical, and one feels in him, even when in the greatest disagreement with his views, one of the greatest thinkers of the eighteenth century. As a writer he is admirably clear, distinct, and

forcible, occasionally brilliant. He has the curious fate of being admired heartily by his enemies, and read almost only by persons who disagree with him. In 1816 he returned to Turin, and died there in 1821.

XAVIER DE MAISTRE, younger brother of the preceding, was born in 1763 at Chambéry. He served in the Piedmontese army in his youth, and his most famous work, "Le Voyage autour de ma Chambéry," was published in 1791. He joined his brother in St. Petersburg during the troubles of the times, and served in the Russian army in the Caucasus, rose to the rank of general, and died at St. Petersburg in 1852 at the great age of eighty-nine. Besides the famous and ever delightful "Voyage round my Room," quite in Sterne's manner, and fully equal to the model, Xavier de Maistre wrote the "Lepre of the City of Aosta," and the "Prisoners of the Caucasus," novels which curiously combine the "sensibility" of the eighteenth century with the exactness of observation, general truth of description, and skill in narrative proper to the nineteenth. His French prose is regarded as an absolutely perfect model by great critics, such as Sainte Beuve, &c., which seems a curious fame to descend on the shoulders of one who was not by birth a Frenchman, seeing that French is considered the most difficult of the great languages as regards the attainment of perfect accuracy of style.

**MAIT'LAND**, a town of New South Wales, 93 miles north of Sydney. The surrounding district is so fertile as to be called "the granary of New South Wales." Coal and kerosene shale are abundant in the district. The town is divided into East and West Maitland. Their united population is about 9000.

**MAIZE, or INDIAN CORN**, is a plant commonly cultivated in the warmer parts of the world, where it answers a purpose similar to that of wheat in more northern countries. It is the *Zea Mays* of botanists, a monocious grass of vigorous growth, with stems not more than 2 feet high in some varieties, and reaching the height of 8 or even 10 feet in others. Each grain has a long thread like style, which projects beyond the enveloping sheaths; and as there are some hundreds of them upon each spike, the whole form a long tassel, which looks as if made of silk. A plant generally bears two full ears, called *cobs*, the grains of which vary greatly in number: some of the largest ears in America contain at least 800 grains.

This plant is certainly a native of America, and De Candolle, in "The Origin of Cultivated Plants" (1885), argues that its native habitat must have been a limited area, and places the probable situation in New Granada.

The bread made from maize is not so palatable to some as wheat bread; but by mixing it in certain proportions with wheat, it makes a very pleasant food. In the United States of North America, Indian corn forms almost the only bread eaten by many of the people; and in the southern states it is the staple food of the negroes. It is not, however, in the shape of baked bread that maize is most generally used in Europe, but in boiled messes and soups, like pea-soup. Broken or split maize is known as HOMINY. Professor Church says that "maize is poorer than wheat in flesh-formers, but richer than rice." It contains more fat than wheat, barley, or rice." He gives its percentage composition as follows:—Water, 14½; fibrin, &c., 9; starch, &c., 64½; fat, 5; cellulose and lignose, 5; mineral matter, 2.

A light, moist, and warm soil suits this plant best. It thrives well on land broken up from grass. The time for sowing maize in the south of France is the month of April; further north it is sown later. When the maize is fully ripe, the ears are twisted off by hand and laid in a dry place; they are turned occasionally, that the sheath may not become musty, and are then stored in a dry place. The younger ear is preserved as a pickle, like young cucumbers; when a little advanced it is roasted on the coals or before

the fire, and is pleasant to eat. In the green state, when the grains are still soft and milky, it is boiled and used as a vegetable, and is considered a delicacy.

Horses, pigs, and poultry are fond of maize; it gives the flesh of the last two a peculiarly fine flavour. The best proof, perhaps, that could be given of the usefulness of maize as food for horses was that adduced by Mr. Church, manager of the London General Omnibus Company, before the Select Committee on Horses, in 1873. He said that for several years they had discarded oats as forage, and their horses are fed entirely on maize and chaff, each horse receiving as its daily ration about 17 lbs of the former and 10 lbs. of the latter. Maize has begun to attract the attention of farmers in England as a fodder crop. It grows very quickly, and has produced 30 tons an acre after a drought which lasted fourteen weeks without a drop of rain. It does not exhaust the soil if cut, as it must be in this country, before it seeds.

**MAJESTY.** Among the Romans the word *majestas* was at first used to signify the power and dignity of the people, and also of their representative assemblies, which derived their power from them. Its use during the republic is equivalent to our word "treason," the single word being held to mean "(offence against the) Majesty (of the State)." On the establishment of the empire, the appellation became exclusively the attribute of the emperors, as containing in themselves the sovereign power or greatness (*majus*), and from them it descended to those of Germany, who considered themselves their successors. It is now usually bestowed on all sovereigns, but its adoption is of comparatively recent date. "Your Grace," or "Your Highness," was the mode of addressing the king in England up to the latter part of the reign of Henry VIII., when the term Majesty was first employed. Henry II. was the first king of France so styled. Louis XI. and his successors on the throne of France were granted the title of "Most Christian Majesty" by a bull from the Pope; and by virtue of the same authority Ferdinand and Isabella of Spain obtained for the sovereigns of that country the title of "Most Catholic Majesty." The same power also conferred the title of "Apostolic Majesty" on Maria Theresa and her successors of Austria. The Queen of England is personally addressed as "Your Majesty," but in writing as "The Queen's Most Excellent Majesty."

**MAJOLICA or MAIOLICA WARE** is a kind of enamelled earthenware, of which other names are *Raffaello ware* and *Umbrian ware*, the first from the fact that Raffaello at one time of his life designed for it, and the second from the fact that the great Italian majolica factories were in Umbria. In the article CERAMIC ART the permanence and vast antiquity of pottery, its chief and oldest division, is fully treated of, and the name of majolica, the crown and flower of the potter's art as distinct from porcelain, is shown to be simply the Italian name for the island of Majorca. Dante has preserved the old name in a line of the twenty-eighth book of the "Inferno,"

"Tra l'isola di Cipri e di Maiolica,"

meaning the islands Cyprus and Majorca. It was from Majorca that the Italians derived the ware, but the question remains how came it in Majorca? The Romans followed the Greeks as great masters of the ceramic art, but at the downfall of the empire the barbarians and Franks, who chiefly ruled in Western Europe, cared nothing for the finer joys of life, and decoration of all sorts lapsed into rudeness. But away in Persia the manufacture of those lovely glazed tiles which still delight the traveller in old buildings in that country of lost splendour, was at this time in full career; and the Moors in their occupation of Spain brought this among many other refined forms of fine art. The buildings at Seville, Toledo, and above all Granada, with its Generalife and its peerless Alhambra,

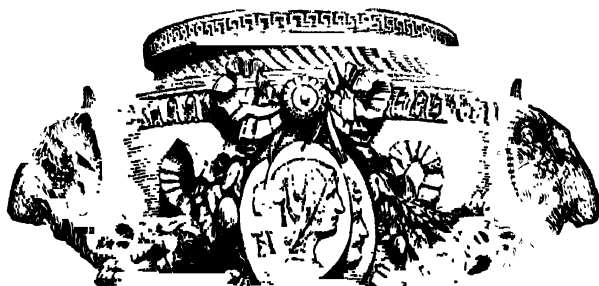
attest the vigour and success of this exquisite art. These tiles (*azulejo* in Spanish) are of a pale clay covered with thick white opaque enamel, on which the elaborate designs are painted and burnt in. The mayor's chapel at Bristol is paved with original Spanish *azulejos*, brought by some merchant dealing with Seville, no doubt. Except as to specimens in museums these Bristol tiles are unique in England. So highly were they prized in Spain that long after the art had decayed and the Moors had gone, they were eagerly sought; and this is attested by the proverb, *Nunca haras casa con azulejos* (you will never have a house covered with *azulejos*), which answers to our "You will never set the Thames on fire." The Spanish Moors not only produced these unrivalled *azulejos* (beautifully copied at the Crystal Palace, Sydenham, in the Alhambra Court), but also vases and other potter's work. All are of the most exquisite beauty of form and colour. The date ranges from the fourteenth to the end of the sixteenth century; and a few pieces were made during the greater part of the seventeenth century, until the Spanish workmen gradually allowed the Moorish traditions to die out. Malaga, Valencia, and Majorca were the three great Ceramic centres, and probably rose in that order. The great factory at Majorca was at Yucca, not far from the capital, Palma. At the Cluny Museum, Paris, is a fine Yucca plate, and another is in the British Museum. Both bear the arms of the town. All museums have plenty of Spanish specimens of this Moorish enamelled pottery.

In the twelfth century the Pisans had a kind of crusade against the infidels of Spain, and in 1115 they took the chief town of Majorca, killed the Moorish king, and pillaged the island. Among their spoils were many plates of the fine Moorish majolica, and these *bacini* they used, *azulejo* fashion, to decorate their houses and churches at Pisa. At Pavia as well as at Pisa these *bacini* may be seen let into the façades of the churches in a most charming manner. It has recently been found that many are imitations only, the originals having been nefariously removed on account of their great value, but no one knows when or by whom. The Moors had long been settled in Sicily, and it was therefore not long before the new taste for enamelled pottery called forth workmen to supply it. During the thirteenth century opaque-coloured pottery was readily produced in Italy; but by the beginning of the fourteenth century, under the Malatestas, lords of Pesaro, a very fine early majolica, far superior in fineness of enamel and of colour to anything done by Moorish workmen in Italy, had sprung up. The red potter's clay was coated with an *engobe* (or layer) of white Sienn earth, on which the patterns were painted and afterwards preserved by a lead glaze. Sometimes patterns were scratched in the engobe, giving the style of decoration called *sggraffito* or *marzacotto*, of oxide of lead and glass. This glaze soon partly decayed if exposed to the air, and a lovely metallic iridescent lustre spread over the whole face of the ware. Such is the precious *mezza majolica*.

Lastly, in 1400 was born the famous artist Luca della Robbia, the greatest genius who ever worked in clay, and whose humility has been rewarded by those of his works which have survived the dangers of time coming down to an admiring posterity as fresh as the day they left his kiln. He began as a goldsmith, then (as so many goldsmiths did at this time) he turned sculptor, and finally he

found that if he took his figures of clay, ready modelled for the marble, he could, by thickly coating them with a mixture whose base was tin-oxide, obtain an opaque white smooth enamel, and at once produce imperishable works of art, without the vast manual labour of the sculptor in marble. He had made a fine pair of bronze doors for the Duomo of Florence, and in the arch above he placed his first bas relief, white on a blue ground (1438). Subsequently he introduced other colours, but always very sparingly. No one has ever equalled either his delicacy of colouring, his purity of modelling, or his mastery of the material.

The stanniferous (tin) enamel which Della Robbia had brought to such perfection was soon seized upon by the artists of Pesaro. The Sforza family now held the town by right of purchase from the Malatestas (become lords of



Majolica Vase.

Rimini), and other towns near Urbino also started factories. Lorenzo de' Medici writes to the Malatesta of the day, who had sent him some plates, that he "valued them more than silver." *Mezza majolica* was abandoned for true majolica by the end of the fifteenth century. Pesaro began it later than the rest, in 1500, lingering upon its old well-earned reputation.

The method was now perfect. The half-baked common earth plate was dipped into the enamel, chiefly of tin-oxides (60 per cent.), but with lead and other combinations added. This gave a vitreous opaque coating, and while it was yet moist the painter worked upon it, holding the piece upon his knees. No retouching was possible, as the colours at once sank into the enamel. This rapid drawing and the necessary accidents of the colours "running" sometimes, accounts for the imperfections in drawing and painting often found in even the finest majolica. The drawing finished, the piece was dipped into a transparent glaze and

fired, and if it was to bear a lustre it was afterwards dipped into a lustrous metallic glaze and fired a third time.

About the end of the first quarter of the sixteenth century the famous manufactory of Gubbio rose to its greatness. Its prismatic glaze, superb ruby lustre, and gold and silver hues have never been equalled, though its designs were afterwards surpassed. The greatest perfection of majolica was from 1540 to 1580. The great Raffaele designed for some of the pieces, but the best period began twenty years after his death: the name of *Raffaele ware* is to a certain extent, therefore, a misnomer. The great period is full of Raffaele designs, but they are collected designs of the master, worked from like any other patterns. The chief patron and the author of this wise choice of designs was Guidobaldo II., duke of Urbino, who gave his workmen any Raffaele and Marc Antonio designs he could obtain to work from. For some of the vases of the Guidobaldo period Christina of Sweden vainly offered their weight in gold. Urbino, Pesaro, and Gubbio were the great centres of these wonderful productions, Urbino and Pesaro were often being sent to Gubbio to receive the unique Gubbio lustres; and the small town of Castel Durante equalled those three in the perfection, if not in the number of its pieces, and outlasted them by half a century.

Other towns throughout Italy followed (at a respectful distance), but until financial needs pressed upon the splendid Guidobaldo, Urbino retained its pre-eminence. The only dangerous rival was FAENZA, which gave its name to *Faience*, the French term for all artistic pottery. A decline can be traced from 1560, when some of the best artists died, and when the duke could no longer afford to continue the grand historic style hitherto adopted. In 1631 Francesco Maria II., the successor of Guidobaldo, died, and the valuable art-collections were removed to Florence, except those given to Our Lady of Loretto.

Naples, Venice, Siena, and Savona all made fine majolica after this, and in 1763 a factory was reopened at Pesaro; but Oriental porcelain was now the fashion, and native ware seemed "vulgar." It was found impossible to revive it, and until the excellent work of Minton and Doulton of our own day enamelled pottery was a lost art. A piece of majolica of the finest period forms part of the third Plate illustrating the article CERAMIC ART. See also the Plate accompanying the present article.

**MAJOR** (Lat., greater), a field-officer next in rank below a lieutenant-colonel, and immediately superior to the captains of troops in a regiment of cavalry, or to the captains of companies in a battalion of infantry. His duty is to superintend the exercises of the regiment or battalion, and on parade or in action to carry into effect the orders of the colonel. The major has also to regulate the distribution of the officers and men for the performance of any particular service.

A major-general is the lowest grade of general, ranking beneath lieutenant general, in the English army.

A brigade-major is a staff-officer who performs for a brigade, or in a garrison, duties corresponding to those of a major in a regiment or battalion.

A sergeant-major of a regiment is a non-commissioned officer, who in general superintends the military exercises of the soldiers; on parade he has the care of dressing the line.

**MAJOR**, in music, means, as its name implies, the greater interval. Thirds and Sixths (consonds), Seconds and Sevenths (discords) are *major* in their largest extent, *minor* when one semitone less. Some writers call Perfect Intervals (Unison, Octave, Fourth, Fifth) *major*, but this does not seem desirable. A major scale has every interval *major* (or perfect). A major Second has two semitones, a major Third four, a major Sixth nine, and a major Seventh eleven. See INTERVAL, KEY, SCALE.

**MAJOR CA.** an island, the central and largest of the Balearic group in the Mediterranean, belonging to Spain,

and about 112 miles south of Barcelona. Its length is about 58 miles from east to west, and its breadth about 45 miles. The area is 1420 square miles. The surface is uneven and finely varied by valley, plain, and mountain, the greatest height being the Silla de Torillos, 5114 feet above the sea. The climate is mild and healthy, and the soil is rich in pasturage and fertile, producing the vine, olive, fruits, saffron, wheat, oats, maize, &c. The chief manufactures are of linen, woollen, and silk; hats, cabinet-work, &c. The population numbers about 210,000. See BALEARIC ISLANDS.

#### MAJOR-GENERALS OF CROMWELL, THE.

Great patriot as Cromwell was, it needs all one's force of hero worship to forgive him his tyranny by the major-generals. The reaction had set in after the complete triumph of the parliamentary party, and the government was seriously alarmed. In 1655, upon the angry dissolution of his first regular Parliament, which had shown every disposition to thwart the Protector, Cromwell divided all England into ten districts, and over each of them he placed a major-general with full military powers. The duties of these officers were to disarm all Roman Catholics and royalists, and to arrest every recusant and malignant on suspicion. The large expense of this tyranny, from which there was no appeal except to the Protector in council, was borne by a tax levied (in defiance of Magna Carta) on the sole authority of Cromwell, of one-tenth of all movable property and income, upon all known royalists or *ci-devant* royalists. The Episcopalian clergy were silenced, the press was gagged. Some opposition was offered to the new tax; those who resisted by force were put down by force, those who sued in courts of law were sent to the Tower with their counsel and abettors. In 1657 Cromwell's second Parliament debated the question of indemnity for the appointment of the major-generals, and so universal was the opinion that legal government should be returned to that the Protector at once withdrew them.

**MAJU'BA HILL**, one of the hills of the Drakenburg range in South Africa, 2500 feet in height, which overlooks Lang's Nek, the principal pass through the mountains on the road to Pretoria in the Transvaal. It was here that the British were defeated by the Boers on the 27th February, 1881.

**MAKRIZI, TAKKI-EDDIN-AHMED**, a celebrated Arabic writer, was born at Makriz, a village near Babelber, between 1358 and 1368. It appears that he resided at Cairo during the greater part, if not the whole of his life, that he discharged at different times the duties of several public offices, and that he died, at an advanced age, in 1442.

Makrizi wrote several historical works, of which the most important is his "Description of Egypt," which gives an account of the history of the country from its conquest by the Mohammedans, as well as a description of its natural history and antiquities, and of the manners and customs of the inhabitants. He is the great authority for the Fatimid caliphs and for the early Memluk sultans of Egypt. An excellent French translation by Quatremère (Paris, 1845) well repays perusal.

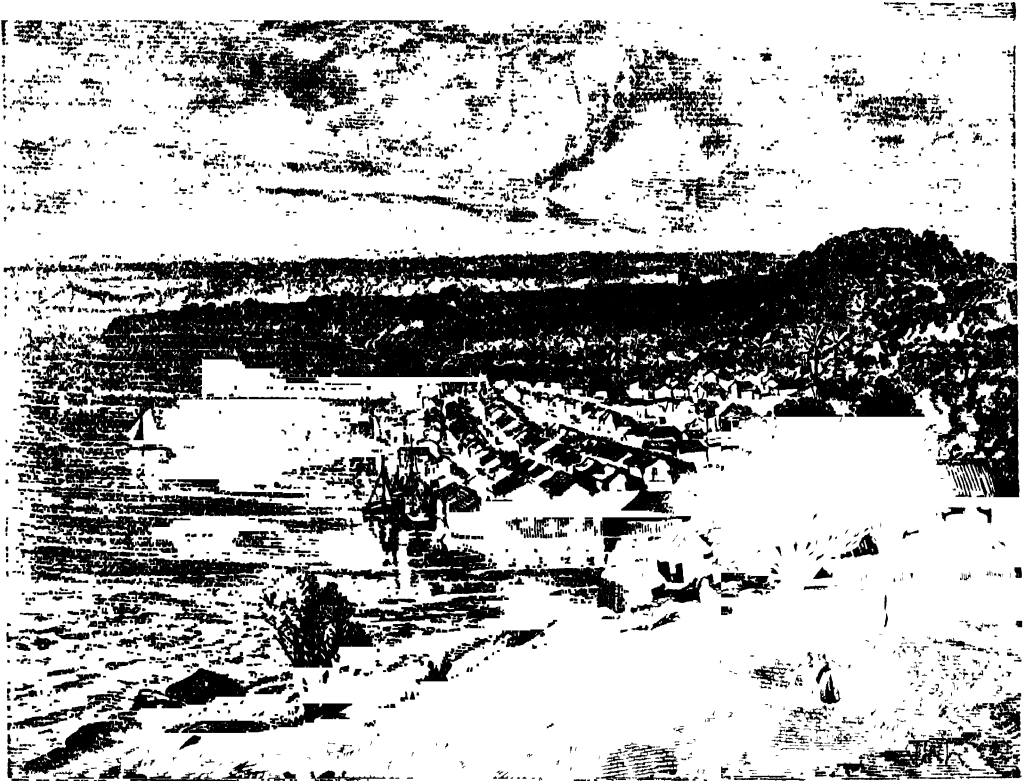
**MALABAR**, a district of British India, in the province of Madras, and lying along what is called the Malabar coast of the Arabian Sea for a distance of 145 miles. The area is 6000 square miles, and the population 2,300,000. The administrative headquarters are at CALCUT.

**MALAC'CA**, a British settlement and town in Southern Asia, situated on the western coast of the Malay Peninsula, on the Straits of Malacca, and divided into two parts by the small river Malacca, which is here crossed by an iron bridge. The remains of Portuguese and Dutch forts still occupy summits around the town, the principal edifices in which are the barracks, court-house, town-house, gaol, civil and military hospitals, and convict prison. Altogether the town is well built, and presents an imposing

appearance from the sea. Small vessels can enter the river at high water and go up for about a mile. It contains the Church of Our Lady del Monte, the scene of the labours and supposed miracles of St. Francis Xavier, "the Apostle of the East." Malacca was first visited by the Portuguese in 1507, and was taken by Alfonso Albuquerque in 1511. It continued in a flourishing condition till 1640, when it was taken from the Portuguese by the Dutch. The British obtained possession of it in 1795, the Dutch in 1801, the British again soon afterwards, the Dutch again in 1814, and the British finally captured it in 1824.

The settlement consists of a tract of country about 40 miles long and 30 miles wide. The country lying along the sea-coast, to the distance of 12 or 15 miles, is low and nearly level; in many parts swampy, and mostly covered with wood. The climate is salubrious, the thermometer

ranging from  $72^{\circ}$  to  $85^{\circ}$  Fahr. The soil near the coast is fertile, and is largely occupied by rice fields; other products are tapioca, sago and tropical fruits. The tapioca plant grows 8 or 9 feet high; it thrives in almost any soil, and has a root like a sweet potato; from this the tapioca is made by paring off the skin, crushing, frequent washing, and passing through sieves. Sago is prepared much in the same way. Inland the country is more hilly and less fertile, and rises gradually in wooded knolls and hills towards the grand background of Mount Ophir, 40 miles inland and 5693 feet in height. The interior is less productive, but at Kassang there are valuable tin mines. The chief exports are tin, tapioca, sago, and fruits. Several hot springs are found in the interior, about 18 miles from the coast. The country is much resorted to by all classes of natives for the cure of various local diseases. Its in-



Malacca.

ports consist of British and Indian manufactured goods, opium, &c. The settlement was separated from Bengal in 1851, and it now forms part of the STRAITS SETTLEMENTS. The inhabitants of the province number about 90,000, of whom about 60,000 are Malays, and 14,000 Chinese colonists. The population of the town of Malacca is about 10,000.

**MALACCA, THE STRAITS OF,** separate the Malay Peninsula from the island of Sumatra. They begin on the north between Diamond Point on Sumatra and the island of Pulo Penang, near the shores of the continent, about  $5^{\circ} 20'$  N. lat., and terminate on the south between the most southern cape of the Asiatic continent, the Tanjung Burus ( $1^{\circ} 15'$  N. lat.), and the islands of Carimon or Krimun ( $1^{\circ}$  N. lat.) Their direction is from north-west to south-east, between  $97^{\circ} 30'$  and  $103^{\circ} 40'$  E. lon. At

their northern extremity they are 250 miles wide, but they diminish to 30 miles near the south. Perhaps in no part of the globe is the temperature of the air less subject to changes than on these shores. In the Straits of Malacca are the British settlements of PENANG, MALACCA, and SINGAPORE, generally called the STRAITS SETTLEMENTS, which are all under one governor, whose headquarters are at Singapore.

**MAL'ACHI,** the last of the prophetic books in the Old Testament canon, is described in its introduction as being "the burden of the word of Jehovah to Israel by the hand of Malachi." The name given may either be an adjective signifying angelic, or a contraction of *malachijah*, messenger of Jehovah. It occurs nowhere else as a proper name, and many critics consider the prophecy to be an anonymous work, its title being either a name assumed by

the writer to express his mission, or one that has been attached by an editor. Though nothing is known as to the author of the prophecy, the book from internal evidence may be assigned, with some degree of confidence, to the age of Nehemiah. In its tone it is thoroughly post-exilic, and its style, though it is marked by dignity, is somewhat prosaic and lacking in the poetic fervour and freedom of the earlier prophecies. It contains, however, many passages of much force and beauty, and its predictions concerning the coming of a messenger in the form of Elijah, to prepare the way of the Messiah, have always been considered, both by Jews and Christians, as among the most important prophecies of Scripture. The canonical authority of the book has never been disputed, and it is quoted several times in the New Testament.

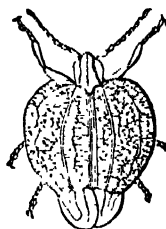
**MAL'ACHITE** (Gr. *malache*, marsh mallow, in allusion to its green colour) is a hydrated carbonate of copper ( $\text{CuCO}_3 \cdot \frac{1}{2}\text{Cu(OH)}_2$ ). It contains about 57 per cent. of the metal, has a specific gravity of about 4, and hardness of 3.5. When crystallized the crystals belong to the monoclinic system, but this mineral most usually occurs as a deposit from aqueous solution in botryoidal or stalactitic forms. The colour is a bright green, varying in shade; hence this mineral is also known as *green carbonate of copper*, in contradistinction to the *blue carbonate or azurite*, from which it differs chemically in being more hydrated.

Malachite occurs associated with other ores of copper, and in most instances appears to be a secondary product formed from their solution and subsequent redeposition. In many instances it is formed from copper pyrites, by the oxidation of the sulphide and formation of a soluble sulphate. From this solution malachite is precipitated in nature by a carbonate of one of the alkalis or alkaline earths. The green colour so common about calcareous rocks in which copper ores occur is due to this reaction; but in many cases deposits of malachite appear to have been produced in a manner analogous to the formation of stalagmitic deposits of carbonate of lime.

Malachite is a valuable ore of copper when occurring in sufficient abundance. In Siberia there are large and notable deposits of it, and it also occurs at Burra-Burra and other places in Australia. This mineral is, however, chiefly used for ornamental purposes; it is capable of receiving a high polish, and is not difficult to cut. The successive layers of deposition vary slightly in their shades of green; these in cross section present a pleasing variation. The fragments of malachite are first sawn into thin plates, about the tenth of an inch in thickness. The artist has to determine what convolution or pattern the different green-tinted markings will present in the finished article, and he so selects the veneers, or small pieces, as to attain that object. When the pieces have been fixed with cement on some substance, as marble, copper, or iron, the small interstices are filled up with cement mixed with particles of malachite, and coloured with a powder of the same material. After this the grinding and final polishing takes place. The process is very tedious and expensive. Moreover, the cost of the raw material is very great. The average pieces brought up from the mine are valued at 15s. per lb.; and there is, besides, considerable waste in the working. All these circumstances materially add to the costliness of the articles produced. The *chrysocolla* of the ancients is supposed to have been malachite.

**MALACOD'ERMI** is a group of beetles belonging to the section Pentamera, distinguished by having the body frequently soft, and the under surface of the prothorax neither produced in front nor pointed behind, the antennæ moderately long, thread-like, or serrated, and the legs moderately long and slender. The larvae have a somewhat flattened body with a firm or horny skin; they are mostly carnivorous, while the perfect insects in the majority of cases

feed on flowers. The most typical family in this group is Telephoridae, containing the beetles known in this country as Soldiers and Sailors. The Telephoridae have an elongated soft body, with six or seven free abdominal segments and long legs. Near them must be placed the Lampyridae, to which the well-known GLOWWORM belongs, and the two families Drilidae and Lycidae, which are often regarded as subfamilies of Telephoridae. *Drilus flavescens* is a common beetle in chalk pits in the southern counties of England; the female is wingless and grub-like, and the larva feeds on snails. The Lycidae are mostly tropical; some of the species are brilliantly coloured, being often reddish-yellow, barred with dark-blue or black. Many of the North



Lycus appendiculatus.



Larva of Drilus.

African Lycidae (see the figure) have strangely expanded elytra, especially in the males. In the subfamily Melyrinæ are two beautiful little British beetles, species of the genus *Malachius*, which are remarkable for the curious crimson vesicles which are protruded from the sides of the thorax and abdomen when the insect is alarmed or irritated. The CURRIEÆ form a large and important family. The Ptinidae are very destructive in the larval state to furniture, &c., by drilling holes in the wood; to this family belongs the DEATH-WATCH (*Anobium punctum*). The Bostriichidae are wood-boring insects, often very destructive to trees.

**MALACOPTERYGI** is a name introduced in the beginning of the eighteenth century by Arcted, and adopted by Cuvier, for a great group of bony fishes, distinguished by all the rays of the fins being soft and cartilaginous, exhibiting minute articulations, and often divided into small fibres at their extremities. It frequently happens, however, that the anterior ray of the dorsal or of the pectoral fins is hard and bony—a character observable in nearly all the species of the Siluridae; and in many belonging to other families. In addition to the rayed dorsal fin, a second dorsal is also present in many, as Salmonidae, Siluridae; this is the *adipose* fin, soft and without rays. The Malacopterygi compose the modern orders ANACANTHINI and PHYSOSTOMI, of the subclass Teleostei.

**MAL'AGA**, a city and seaport of Spain, capital of the province of the same name, is situated on the shore of the Mediterranean, and has 112,000 inhabitants. The Guadalmedina, a mere brook in summer, but in winter a stream of considerable volume, enters the sea immediately to the west of the city. Malaga is of great antiquity. It was possessed successively by the Carthaginians, Romans, Goths, and Arabs. In 1487 Ferdinand and Isabella wrested it from the Moors after a siege of three months. Malaga has suffered severely in different epochs from the plague, which on one occasion cut off 20,000 of the inhabitants in forty days, and in 1803–4 the yellow fever decimated the population. It is, however, much resorted to in winter on account of the general salubrity of its climate. In fact winter in an English sense is unknown, and it is considered by many to be superior as a resort for invalids to any place in France or Italy. It was connected with Granada by railway in 1874.

From the earliest ages Malaga has been renowned for its

commerce. Its imports are colonial produce, broadcloths, cottons, linens, coals, machinery, hardware, and codfish. Its exports consist of wines, grapes, muscatel raisins, almonds, figs, oranges, lemons, olive oil, esparto grass, lead, and iron ore. Though the streets are narrow, tortuous, ill-paved, and dirty, the city has a gay and cheerful aspect, as the exteriors of the houses are white-washed or painted yellow. Many of the roofs are flat, as in the East, and are surmounted by square towers with open galleries, where the citizens enjoy the cool sea breezes. The city has several schools and public hospitals, two large iron-foundries, and a royal cigar factory. Malaga possesses a cathedral, a light and handsome building in the Græco Gothic style, which is nearly 400 feet long, 180 broad, 125 in height, and is surmounted by a spire 302 feet high. The other public buildings are the bishop's palace, four parish churches, five hospitals, the opera-house, custom-house, legal seminary, and a convict dépôt. A great bull-ring was erected in 1876 to accommodate 12,000 spectators. The harbour of Malaga is spacious enough to accommodate a large fleet; it is protected on the east by a massive stone mole, 6 furlongs in length, and terminated by a handsome lighthouse. There is, however, a tendency to silting up, which, if not prevented, will seriously injure the commercial facilities of Malaga. Vessels drawing more than 18 feet have to lie in the roads outside. The sea is gradually receding, and the Moorish dockyard and quay are now in the town, while the *alameda* or public walk was covered with water in the last century. The great boast of Malaga is the Moorish castle, built in 1279, and covering the slope of a hill immediately to the east of the city; it is of great extent, and still shows the effect of the Christian artillery in the siege of 1487.

**MALAPTERURUS.** See ELECTRIC CAT-FISH.

**MAL'ARIA** (Ital. *mala*, bad; and *aria*, air), the name now used in medicine to describe a poison generated in soils the energies of which are not expended in the growth and sustenance of healthy vegetation, and which rises into, and is carried by, the atmosphere. It is synonymous with the terms *marsh miasm*, and *paludal poison*, and the French *intoxication des marais*. By almost universal consent this poison is recognized as the cause of the diseases known as ague, intermittent and remittent fever, marsh fever, jungle fever, hill fever, &c., and of the degeneration of the blood and consequent deterioration of the physical powers which result from long residence in places where it prevails.

It has been estimated by competent observers that malaria causes about one-half of the entire mortality of the human race, and though this estimate probably overshoots the mark, it is certain that in many regions of the earth, and these among the most densely peopled, two-thirds of the mortality is caused by malarial fevers and their sequels. It was until the last century a very common cause of death and disease in Great Britain, and among historical personages it may be mentioned that James I. and Cromwell both died in London of malarial fever. By drainage and cultivation it has been almost banished from Great Britain, though there are yet a few districts where ague still lingers as an endemic disease. On the Continent malaria becomes a more serious enemy, and while no country is entirely free from it, there are many districts where it exercises a terrible power, and some which it renders wholly uninhabitable. Among the more pestilential districts, the lower basin of the Danube from above Vienna to the Black Sea, the delta of the Po, the Roman Campagna, the Pontine Marshes, Charente in France, and several of the islands of the Mediterranean may be mentioned, while there are also numerous unhealthy localities on the shores of the Caspian and Black Seas. Its greatest power, however, is to be found in the tropical and subtropical regions, where it prevails to a greater or lesser

extent almost universally, the west coast of Africa, the American coast from the Gulf of Mexico to Pernambuco, and the Terai, the Deah, and the Sunderbunds of India being regions of special intensity.

Notwithstanding the wide extent of the influence of malaria and the numerous opportunities afforded for investigation, the nature of the malarial poison has not up to the present been clearly demonstrated, but there are many points connected with its origin and development which have been repeatedly observed and confirmed. Malaria is notoriously common in the deltas and estuaries of rivers, in low lying country which is liable to inundation, inland swamps and marshes, tropical forests and jungles, and the mangrove swamps of the American and West African coasts. It is not, however, confined to such districts as these, for there are numerous places where entirely opposite conditions prevail, but which are yet terribly affected by malaria. Thus the Roman Campagna is in many places dry and free from stagnant water, and some parts of Africa and India equally infested with malaria have the appearance of being dry sandy plains. Even districts which are chiefly composed of dry barren rocks are in some instances notorious for the malaria which prevails, but in nearly every case the conditions of a rich vegetative energy without proper outlet may be found, or the rocks are of a character which renders them highly absorbent of heat and water. In temperate climates the autumn is the season when malaria is most prevalent, and in the moist equatorial regions it exercises the greatest influence at the commencement and close of the rainy season. In the dry barren districts infested with malaria the worst period is that of extreme heat and drought.

With respect to the diffusion of malaria it has been proved that as a rule it acts only within a few feet from the ground, and in the East Indies houses are sometimes built on piles for this reason, while in South America some tribes of the Indians escape it by sleeping only in the branches of trees. At the same time where it is moved along the ground by a wind or current of air not strong enough to disperse it, it may creep up the sides of a hill for a long distance, and for this reason buildings erected upon hills some hundreds of feet above the level of an adjacent malarious plain may be more under its influence than those on the plain itself. The distance to which it can ascend varies in different climates from 500 to between 2000 or 3000 feet. It has been found in most malarious districts that there is a certain line beyond which the influence of the malaria is seldom felt, and one of the best protections known is that of a belt of trees. In fact, certain trees of the eucalyptus species seem actually to absorb the poison, and malarious places are now in consequence largely planted with them. A wide sheet of water is also a great protection, though in tropical countries the malaria sometimes travels off shore and reaches ships which are lying 2 or 3 miles out at sea. The latter, however, is an exceptional circumstance, and more often ships which thus remain out at sea manage to escape infection. Occasionally malarial fevers have made their appearance on ships far out at sea, and which have not touched at any malarious port; but this is an event of rare occurrence, and when it takes place it can generally be traced to putrid bilge water, or decaying vegetable matter within the ship itself.

Although it seems to be fully proved that the poison of malaria is generated in the soil and conveyed by the atmosphere, all attempts that have been made to separate a poisonous gas from the air of malarious localities have hitherto ended in failure. Some investigations made in the spring season of 1879 by Professor Crudeli of Rome and Professor Klebs of Prague, resulted in the discovery of a microscopic fungus, consisting of numerous movable shining spores of a longish oval shape, and 9 micromilli-

metres in diameter. This fungus was afterwards artificially generated and introduced under the skin of healthy dogs, all of which were afterwards seized with intermittent fever, a large quantity of the characteristic form of fungus being afterwards found in the spleens of the animals thus affected. This organism, which was detected in abundance in the soil and lower stratum of the air of the malarious district inspected, was named by its discoverer the *Bacillus malarie*, and further investigations have resulted in the detection of it in the human subject. This discovery is one of an extremely interesting character, but at present it awaits confirmation on the part of independent observers in other parts of the world.

The chief diseases which arise directly from malarial poisoning have already been described [see AGUE, FEVER], but it may be observed that in addition to the fevers induced by it, persons who are long exposed to its influence suffer a physical deterioration to which the term *malarial cachexia* is now applied. The inhabitants of a malarious region are generally feeble and listless, and very liable to suffer from anæmia.

In the people the skin is generally of a brown or yellow tint, and they suffer from enlarged livers, and more especially from enlarged spleens. The latter is a characteristic sign of malarial poisoning, and it sometimes exists in a very marked degree. Other consequences of malarial poisoning are neuralgic affections, especially in the supra-orbital nerve (brow-ache).

In the article AGUE, we have indicated the precautions which should be observed in passing through a malarious country, and we need only mention here that the great remedy for malarious diseases is found in quinine. No other remedy has yet been discovered that will take the place of this drug, though several are known which are useful adjuvants, and which may be used with advantage where quinine cannot be obtained. Among these the best known are salicylic acid and arsenic. The latter is a very old remedy for ague, and it is used in the French army in the place of quinine for economical reasons.

**MALATESTA**, a famous princely semi-independent family of mediæval Italy, lords of Rimini, which they enriched with the treasures of art, and occasionally made very famous. The first one rose to the lordship of Rimini as a leader of the Guelph party against Faenza and Forlì. He received Rimini as his reward. The greatest member was Sigismondo Malatesta, who fought for his inheritance in 1432 when a lad of fifteen, who built the exquisite church of St. Francis at Rimini, and the citadel at Rocca, of which but little now remains, and whose history of crime and adventure is one of the most impressive and representative of the independent petty princes of his time. After a brilliant career he ended his life with only the city left him, amid treacherous intrigues and menacing foes. The Pope (Paul II.) was one of the worst, and Sigismondo started to Rome with a dagger clutched beneath his vest. The Pope was warned, however, and received him only in public. Both his wives probably died by his hand; and the joint monogram of himself and his famous mistress Isotta (who once stood a siege of Rimini in her lover's absence) mocked with its IS the sacred monogram over all the wonderful temple he had raised. He died in 1466 of a fever.

**MALAY PENINSULA** constitutes the most southern extremity of the continent of Asia, extending between the Bay of Bengal and the Straits of Malacca on the west, and the Gulf of Siam and the Chinese Sea on the east, and connected with the mainland by the Isthmus of Kra, which it is proposed to pierce by a canal. It lies between 1° 15' and 15° N. lat., and 98° and 104° E. lon. Its length is 750 miles, and its width from 60 to 180 miles. The area is estimated at 70,000 square miles.

The peninsula is traversed by a mountain range, which has several peaks 3000 feet high, while a few of the mountains attain an elevation of 6000 feet.

The comparatively small width of this peninsula and the disposition of the mountain range prevent the formation of considerable rivers. The largest which are known are the Muar and the Pahang; the former falls into the Straits of Malacca, and the latter into the Chinese Sea. The number of small rivers is very great.

The climate differs on the eastern and western sides of the peninsula, according to the peculiar action of the monsoons. The eastern side is most affected by the north-east monsoon; the western in part by the south-west monsoon, but is in part sheltered from both monsoons.

The soil seems not to be distinguished by fertility. The plants cultivated are chiefly rice, pepper, cotton, coffee, and a great variety of fruits.

Cattle are few in number, but buffaloes abound. No sheep are kept; hogs and fowls are plentiful. In the uncultivated parts of the peninsula, opium, and rhinoceroses are frequently met with, and sometimes elephants. Among the birds that kind of swallow which makes edible nests is the most remarkable.

The most important articles of commerce are from the mineral kingdom. Gold and tin are plentiful, and are regularly exported—about 20,000 ounces of the former, and 2400 tons of the latter annually. From the gold found here, the peninsula obtained the name of the *Aurea Chersonesus* among the ancients.

The bulk of the population consists of Siamese and of MALAYS. The former occupy the isthmus of Kra and the districts north of 6° 40' N. lat., and the latter the remainder of the peninsula. The entire population is computed to be about 600,000.

The northern part of the peninsula, as far south as the Bay of Chai ya, is immediately subject to the King of Siam. On that bay are two harbours, called Chai-ya and Bandon, and on the opposite western coast the bays of Phung and Pongo. The district between the Bay of Chai-ya and Cape Patani is partly governed by Malay sovereigns, dependent on the King of Siam, and partly belongs immediately to Siam. The kingdoms of Calantan and Tringano on the eastern, and that of Queda on the western side of the peninsula, are only nominally dependent on Siam. Tringano, situated at the mouth of the little river Tringano, seems to be a considerable place. Two other towns are Queda and Alustar. The British colony of Penang, or Prince of Wales Island, is partly situated within the kingdom of Queda. The southern extremity of the peninsula is divided between the kingdoms of Pahang and Johore on the eastern side, that of Rumbowé in the interior, and those of Salangore and Perak on the western coast, together with the British colony of Malacca. In 1873 serious disputes arose between several of these petty rulers, threatening to end in reducing the peninsula to a state of complete anarchy and confusion. The firmness of Sir A. Clarke, however, who was in that year appointed governor of the Straits Settlements, not only brought the various factions to an agreement, but they engaged to receive and maintain at their own expense a British resident, under whose advice they engaged to act in all matters of government and finance. In October, 1875, Mr. Birch, the resident at Perak, was treacherously murdered, and the interference of British troops was necessary to obtain guarantees for the faithful carrying out of the treaties. This was accomplished in 1876.

**MALAYS**, a nation of southern Asia, who occupy the shores of the Malay Peninsula and the larger islands of the Indian Archipelago, and who are now frequently considered to belong to the Mongolian stock. In person the Malays are short, squat, and robust. The face is of a round form, the mouth is wide, and the teeth remarkably fine. The chin is rather of a square form; the angles of the lower jaw are very prominent. The cheek-bones are high, and the cheek consequently rather hollow. The nose



is short and small. The eyes are small, and always black. The complexion is generally brown. The hair is long, lank, harsh, and black. As a race the Malays are industrious and skilful in trade. The frequent depature, so often noticed, from the ordinary type, is accounted for by an intermixture with Papuan races in the east, and a Caucasian element in the west.

The Malays have made considerable progress in civilization, but more in the island of Java than on the other islands of the Indian Archipelago. They are well acquainted with agriculture and some of the mechanical arts. They have also made some progress in medicine and music. They are undoubtedly more civilized than any of the nations of southern Asia which inhabit the countries between China and Hindustan. Most of them are Mohammedans.

In the larger islands the Malay population generally occupies the lower tracts along the coast, the original inhabitants having retired into the interior.

The Malay group of languages is one of the most peculiar and unique. It even comprises the Malayan (the great islands, except Borneo and Guinea), the Polynesian (the smaller groups, New Zealand, and Madagascar), and the Melanesian (Fiji and other Australasian archipelagos). Of these Malay is the most advanced; but all of them are extremely simple as regards their phonetic structure. Hardly any of them has more than ten consonants, usually seven letters are found sufficient, with the vowels. A syllable may not begin with more than one consonant, and may never close with a consonant. They are further (even Malay) as bare of inflexions, &c., as Chinese; the grammatical relations of the words are indicated only by pronouns and particles, which in Malay alone present some slight appearance of affixes, which generally precede their principals; gender, case, number, mood, tense, person, are entirely absent; there is no distinction between noun and verb and adjective. The roots or bare words are usually in two syllables. The pronouns are finely distinguished by numerical forms, and the first person has a double plural, one comprising the speaker and those whom he addresses, the other comprising the speaker and his friends alone, and excluding the person or persons addressed. *Buntan*, *sapo*, *gamboge*, *shaddock*, and the phrase to "run amuck" (*a. we*), are Malay words used in English.

**MALAYSIA**, called also the *Eastern Archipelago* and *North-west Oceanica*, is a great sea interspersed with many large islands and countless islets, lying between the south-east coast of Asia and the north of Australia. It extends from lon. 98° to 152° E., and from lat. 10° S. to 18° N., or through about 3750 miles of longitude and 1950 miles of latitude. Lying thus on the equator, and near it on both sides, in the region of greatest heat and tropical rain, these islands have a climate as hot and as humid as any on the globe, even more uniformly so than the banks of the Amazons and the great western horn of Africa. The vegetation is in consequence most prolific and magnificent, and presents some of the largest and most showy flowers, and a dense covering of forest from the level of the sea to the summits of the highest mountains. The only exception is found in Timor, and the small islands round it, which are under the influence of the dry south-east monsoon, blowing across the north-east of Australia from March to November. The birds and insects are gorgeous in the beauty of their colours. Many of the islands lie upon the Asian continuation of the great volcanic band of Western America. After embracing the Aleutian, Kurile, Japanese, and Loo-Choo Islands, it passes southwards through the Philippines to the eastern corner of Celebes, where, suddenly shifting to the eastwards, it passes south to Banda, and then turning westwards traverses the whole of the islands, till it ends in Barren Island, in the Bay of Bengal. Everywhere upon it there are extinct and active volcanoes, and

earthquake movements are frequent and also destructive. Celebes, Papua, Borneo, and the Malay Peninsula itself are wholly free from any signs of volcanic action, recent or extinct, and earthquakes are unknown. But this difference in no way influences the aspects of the islands in regard to vegetation or the forms of life. Under this seeming similarity, produced by the dominant influence of the climate, there is, however, a most striking contrast between two great groups of the archipelago, which is only brought out by a close inspection of the fauna and flora, more especially of the former. The contrast is due to a different distribution of land and water in time past, which recent volcanic action has not been able to obliterate. The islands, in fact, form two distinct groups, a western in a shallow sea, and an eastern in a deep sea, wholly different in their fauna; the forms of life in the one are essentially Asiatic, those in the other truly Australian. The western group consists of Sumatra, Java, Borneo, and Bali, which are all connected to one another and to the continent by an ocean floor, depressed no more than 40 or 50 fathoms; and are inhabited by species which occur on the continent. Such are the elephant, tapir, wild cattle, monkeys, and python and other serpents of Borneo; the elephant, tiger, tapir, rhinoceros, monkeys, serpents, and wild cattle of Java and Sumatra, all which inhabit some portion of southern Asia, and could not possibly have passed across the dividing seas and channels, and must have inhabited these lands before they were separated from the continent. Land birds, more especially the perching birds (Insectores), which form by far the greatest number in the class, are as completely limited in their range by such barriers as quadrupeds themselves, except in the case of a few migratory species, and furnish evidence of the same bearing, almost every family found on the islands belonging also to the continent; and the same may be said of the insects.

The eastern or Australian group of islands lies in a sea of more than twice the depth of that which contains the Asiatic or western group. The line of soundings, of 100 fathoms and upwards, runs from the east end of Bali, nearly due north between Borneo and Celebes, so that this Australian group consists of the islands which are a prolongation of Java and Bali, namely Lombok, Sumbawa, Flores, Sumba, Timor, and Timor Laut; of the great islands of Celebes, Gilolo, Boroce, Ceram, and Papua, this last being divided from Australia by a shallow sea. All these islands form one great zoological province with Australia; they have none of the quadrupeds, and very few of the birds of the other group, but, on the contrary, an assemblage of birds identical with those of Australia, and but a single quadruped, a species of prehensile-tailed opossum or Eastern opossum; a species of deer and of wild pig, which are met with, being certainly not indigenous, but of recent introduction. Of 350 species of land birds in Java and Borneo, ten only have passed into Celebes, while 100 species are common to Java and Borneo, though the Strait of Macassar is not nearly so wide as the Java Sea. The contrast, indeed, between the western and eastern groups is so striking, in passing from Bali to Lombok, across a strait only 15 miles wide, or from Borneo to Celebes, that a naturalist feels as if suddenly transported to a different region of the earth.

The races of men in the two groups are scarcely less contrasted than are the other forms of animal life, and their limits are nearly continuous with the boundaries above described. The western group is peopled by Malays. The other race is the Papuan—"taller, dark-skinned, with frizzly hair, bearded and hairy bodied, with long face, prominent nose, and projecting eyebrows; impetuous, excitable, noisy, and laughter-loving, and making no concealment of the feelings and emotions." Equal, if not superior in intellect, the Papuan is not inferior to the Malay in the affections and moral sentiments; he is more violent and

cruel, less upright and honourable in his dealing. Yet has he more feeling for art and decoration of all kinds. With greater vital energy than the Malay, he would seem more easily raised in intellectual development. Less given to maritime enterprise, this race has not spread like the Malay, which has not only encroached greatly on the original domain of the Papuan in these islands, but has also gone out to people the isles of (Western) Polynesia, all the brown races of which are certainly of Malay origin.

**MAL'COLM** was the name borne by four of the Scottish kings. Malcolm I. (943-953) is noteworthy as receiving that grant of Cumbria as a vassal principality from Edmund I. of England which caused in after times such frequent disputes as to the homage due from Scotland. He died by assassination.

**MALCOLM II.** (1001-31) also died by assassination. He submitted to Cnut the Great of England in 1030.

**MALCOLM III.** (*Cannmore*), son of Duncan, fled to Northumberland upon the death of his father in battle against MACBETH in 1039, being at this time about fifteen years old. He was restored to the throne by Siward, earl of Northumberland, in 1057, was an ally of Tostig against Harold, and received Edgar the Atheling when flying from William the Conqueror. In 1068 he submitted to William and did homage for Cumberland; but having married the Atheling's sister in 1070, he began to indicate claims upon the English throne. William therefore advanced upon him in 1072, and again brought him into submission. Malcolm invaded England in 1091, and was besieging Alnwick Castle when he was defeated and killed by Roger de Mowbray (1093).

**MALCOLM IV.**, born 1131, succeeded his father David I. (1153.) He was made Earl of Huntingdon (1157) by Henry II., accompanied him in his French wars, gave up all rights over Northumberland to him, and repeatedly did homage. He died 1165.

**MAL'DIVES, or MALEDIVA ISLANDS** ("the Thousand Isles," lie in the Indian Ocean, and extend nearly on one meridian, 72° 30' E., from 7° 6' N. lat. to 0° 40' S. lat., or nearly 550 miles; but in no part is the breadth of the chain supposed to exceed 50 miles in a direct line. The most northern group or atoll is about 350 miles from Cape Comorin, the nearest point of Hindustan. The islands are upwards of 1000 in number. They are inclosed and protected from the sea, which during the south-west monsoon is violently agitated, by narrow strips of coral reefs, which surround them like a wall. This protecting wall in many places scarcely reaches the surface of the water; in other places it forms a long sandy beach, perhaps less than 6 feet above the level of the sea, and is either circular or oblong. All of these circular inclosures contain breaks, which constitute convenient passages for vessels or boats to enter. The channels which divide these atolls, or atollons—a word itself derived from the language of these islands—are in some places deep and safe, and are navigable by ships.

Within the atolls the sea is not agitated by storms, and there are always soundings in 20 or 30 fathoms' water. The islands are generally situated along the inclosing coral wall, the central part of the atolls containing only few of them. They are all small; not many of them exceed a mile in length and breadth, and a few are less than half a mile. They are generally circular or lozenge-shaped. Many are mere narrow strips, 50 or 100 yards broad, forming a circle, which incloses a lower tract, filled up with broken coral rocks, and dry at spring tides. Within this ring there is sometimes a considerable depth of water, from 1 to 10 fathoms, so that a perfect lagoon is formed. The highest part of the islands is from 6 to 14 feet above water. They are richly clothed with wood, chiefly palm, and are fertile in fruit and various edible roots; they also produce millet, and abound in cocoa-nuts, fowls, and all de-

scriptions of fish. The climate is pleasant, but not healthy for Europeans.

The inhabitants are Mohammedans, and are a timid, inoffensive, and civilized race, carrying on a considerable trade with Bengal, Ceylon, the Malabar coast, and Sumatra. They are expert navigators and sailors, and have schools for teaching navigation on some of the islands, and even make and repair nautical instruments. They are remarkable for their hospitality and kindness to shipwrecked mariners, for which they refuse all pecuniary compensation. Two languages are in use among them; viz. the common, which seems to be peculiar to the people, and the Arabic, as a learned language. They have also a peculiar alphabet. The whole population may amount to between 20,000 and 30,000. They carry on a little trade with Bengal, and they are ruled by a chief, called the Sultan, who pays tribute to the British governor of Ceylon. He resides on the Mali or Maldiva atoll, which contains the largest of the islands, called Mali, and has a circumference of about 7 miles.

**MAL'DON**, a market-town, river port, and municipal borough of England, in the county of Essex, situated 9 miles east from Chelmsford, and 44 from London by the Great Eastern Railway. The town stands on a hill at the junction of the Blackwater with the Chelmer, 12 miles from the sea. Small vessels come up to the bridge, but larger ones ascend by the canal, which has been cut to Collier's Reach quay. Corn, timber, coals, &c., are imported. The town consists mainly of two chief streets at right angles to each other. The principal public buildings are—the old Church of All Saints, dating from 1056, and thoroughly restored in 1867, and improvements made in the windows in 1877; St. Mary's; four chapels; an old town-hall, of Henry VI.'s time; public hall, library, and institute, in the Italian style; custom house; grammar-school; two banks, &c. There are some manufactures of crystallized salt and silk fabrics, and some breweries and iron foundries. On the Blackwater is an extensive fishery. The municipal borough is governed by a mayor, four aldermen and twelve councillors; its population in 1881 was 5168. Maldon formerly sent two representatives to the House of Commons, but under the Reform Bill of 1867 it was deprived of one, and lost the other under the Redistribution of Seats Act of 1885.

In the Saxon era Maldon must have been a settlement of some importance, and Camden is in favour of its being the real *Camulodunum*. It was here that Edward the Elder encamped in 913 and 920, to withstand the progress of the Danish rovers. He raised an extensive camp—of which the vestiges are plainly visible still—which the Danes unsuccessfully attacked in 921. In 993 the Vikings, under Unlaf, succeeded in capturing it and in defeating the Saxon leader, Earl Brihtnoth, who was slain in the affray. The name *Mal-dane* is explained as "the cross on the hill." The custom of Borough English prevails in Maldon.

**MALE FERN**, the rhizome, incorrectly termed root, of *Lastrea Filix-mas*, has been celebrated from ancient times as an anthelmintic. The root stock of young plants should be collected in spring or summer, and a fresh supply obtained every year, as a change occurs in the part a few months after being collected. It should be quickly dried, and preserved in glass or earthenware vessels in a dry place. The interior should exhibit a greenish colour, and possess a disagreeable odour, with a bitter, harsh, astringent taste. See *LASTREA*.

**MALEBRANCHE, NICOLAS**, an eminent French metaphysician, and one of the most illustrious disciples of Descartes, was born at Paris, 6th August, 1638. Of an extremely feeble constitution and somewhat deformed, he learned Latin and Greek from a domestic tutor, and having chosen the ecclesiastical profession, studied theology at the

Sorbonne. In his twenty-third year he joined the Congregation of the Oratory in Paris, and for the next three years devoted himself most unsuccessfully to the study of ecclesiastical history, Hebrew, and biblical criticism. In 1664 he accidentally fell upon the "*Traité de l'Homme*" of Descartes, and at once discovered his true vocation. This work seemed to him like the opening of a new world, and as he studied it he was compelled repeatedly to lay it aside for a time on account of the nervous agitation and palpitation of the heart which its perusal excited. Henceforward he devoted himself to the study of philosophy, and in a few years succeeded in completely mastering the system of Descartes, while at the same time he developed original powers of speculation. In 1674 he published his famous "*Recherche de la Vérité*," a work designed to give an analysis of human nature in relation to the errors induced by the senses, imagination, understanding, desires, and passions, with a disquisition on the true method of discovery. This, which is in some respects his most important work, was followed by numerous others of a theological, philosophical, and controversial character. Among these the more important are "*Conversations Chrétiennes*" (1676); "*Traité de la Nature et de la Grâce*" (1680); "*Méditations Chrétiennes et Métaphysiques*" (1683); "*Traité de Morale*" (1681); "*Entretiens Métaphysiques*" in 1688; and "*Traité de l'Amour de Dieu*" in 1697.

Though he was always of feeble constitution he passed the age of seventy-six. There is a very popular story of Berkeley having visited Malebranche in 1715, and that their discussions had such an effect on the latter that it produced an inflammation of the lungs, of which he died on 15th October of that year. It is, however, very doubtful whether the two idealists ever met. Neither of them has recorded any interview with the other; and though Berkeley had a letter of introduction to Malebranche in 1713 no record exists of its ever having been presented. On account of the clearness and elegance of his style, Malebranche is awarded a place among the classic writers of French prose. As a philosopher he may be said to have propounded a system of mystic idealism. Searching after certainty he refused to regard ideas either as representations emanating from external objects, or as transient states of the mind that is conscious of them; and he sought, by referring them to a higher sphere, and assigning them to God himself, the "place" of spirits, to have solid ground for a science of the surrounding universe.

An edition of the "*Œuvres Choies de Malebranche*," in two vols., with an introduction, was published by Jules Simon in 1846. An exceedingly interesting sketch of his life and philosophy is given in the first volume of Dr. Martineau's "*Types of Ethical Theory*" (London, 1885).

**MALESHERBES, CHRÉTIEN GUILLAUME DE LAMOIGNON DE**, an eminent French statesman, was born at Paris, 6th December, 1721, of the ancient family of Lamoignon, which had furnished many eminent members of the French magistracy. He was carefully educated, and at the age of twenty-four was made a councillor in the *parlement* of Paris. In 1750 he succeeded his father as president of the court of aids, on the promotion of the latter to the office of chancellor. One of the chancellor's duties was to control the press, and this duty was intrusted by his father to Malesherbes, who carried it out in such a way as to lead French authors to pronounce the period of his censorship "the golden age of letters." Grimm declares that the famous "*Encyclopédie*" would never have seen the light if it had not been for his assistance. He boldly remonstrated against some of the abuses of the government, and in consequence of one of the most telling of his writings (in 1771) he was banished to his country-seat. On the accession of Louis XVI. to the throne the ancient *parlements* (convocations of collective bodies of lawyers) were re-established, and the pre-

sident of the court of aid returned after four years' exile. In 1775 he was made minister of the *maison du roi*, and immediately began working on a scheme of fiscal reform, but he resigned his office after a tenure of nine months (12th May, 1776) on the dismissal of Turgot. He then devoted himself to a quiet domestic country life, and pursued with much enthusiasm his favourite study of botany until 1787, when he was summoned by the king to take a place in the ministry, in the hope that his name and popularity might help to stem the rising tide of political and social discontent. He held office but for a short time, and then again retired to the country, afterwards leaving his home in France for Switzerland. In December, 1792, he voluntarily left his quiet retreat to undertake with Tronchet and Desèze the defence of the king before the Convention, and for a month the aged lawyer, with his two colleagues, strove to rescue the king from the fate which awaited him. Twice a day he visited the Temple to inform Louis of all that occurred, and it was his lot to announce to the unfortunate monarch his condemnation and sentence to death. After this he retired to his country house to pass his time in agricultural labours and works of charity, but his efforts on behalf of the king had marked him out for the vengeance of the more ferocious of the revolutionists, and in December, 1793, he was arrested with his daughter, his son-in-law, and his grandchildren. After being kept in prison in Paris about four months, and after seeing his children led to the scaffold—his daughter indeed was guillotined before his eyes—he was executed 22nd April, 1794, in the seventy-third year of his age.

**MAL'ETOTE** (evil toll), the name given to illegal exactions of the English kings who evaded Magna Carta by various pretexts of "regulating trade by the royal customs," &c. The article more particularly subject to maletotes was wool. Magna Carta expressly provides that merchants shall not be subject to evil tolls, but only to the ancient and lawful customs, except by consent of Parliament; and these customs were defined at many successive periods. In 1291 Edward I. seized large quantities of wool, and only released it on payment of a maletote of 40s. on the sack; but in 1297, in the famous *Confirmatio Cartarum*, the king was forced to recognize the illegality of the act and release the wool from the maletote.

**MALHERBE, FRANÇOIS DE**, was born in 1555 at Caen, in Normandy. He accompanied the Grand Prior, Henry of Angoulême, son of Henry II., who went to Provence as governor in 1579, and remained attached to his household till that prince's death in 1585. He was patronized by Henry IV., upon whose death his widow, Maria de' Medici, settled a pension upon him. He died in 1628. All his finest work was written after the age of forty. It amounts in the whole to not more than 200 small 8vo pages.

Malherbe has been styled by competent judges the restorer of the French language and poetry. The eulogium bestowed upon him by Boileau is well known:—

"Enfin Malherbe vint, et le premier en France  
Fit sentir dans les vers une juste enclume."

The actual work of Malherbe does not show very great genius, and is little read now; it is his unique position which makes him so striking a figure. He set to work deliberately to "purify" French, to overthrow the excellent school of the Pleiads and followers of Ronsard with their romantic freedom of form and rhyme, and their wonderful creation of modern French; and to substitute for this a level frigid style, more like metrical prose than worthy of the name of poetry. He was rapidly succeeded by a far greater man, BOILEAU, and French verse was doomed, except for the dramatists, Corneille, Racine, &c. French prose, on the other hand, is almost perfect in this seventeenth century. Even La Fontaine, half rebel as he was, and great genius though he was, lacks the fire of

poetry. All that offends us in the "classical school," all the formal rigidity which is so severe a drawback to the enjoyment of Racine, is due to the stubborn authority of Malherbe.

Not till the greatest poet of France, the immortal Victor Hugo, devoted all the energy of his fierce youth to the task, was the tyranny of the dead Malherbe removed from French literature.

**MALIBRAN, MARIA FELICIA**, afterwards Madame de Beriot, one of the most distinguished singers of any age or country, was born in Paris in 1808. When eight years old she was brought to England, where she remained for eight years, acquiring a thorough knowledge of the English language, already being familiar with Spanish, Italian, and French, and cultivating her musical gifts with the utmost assiduity. Her father, Manuel Garcia, was a man of fierce temper, but an excellent musician, and he taught his daughter the principles of the art, a knowledge which, unfortunately, few singers have ever possessed. She made her *début* in London as Rosina, in the "Barber of Seville," 7th June, 1825, in consequence of an indisposition of the great Pasta, and her success was so marked that she was engaged as one of the principal singers at the York Festival of that year. She then paid a visit to the United States, where she was induced to accept the hand of a man of double her age, M. Malibran, a merchant and banker, who was reputed to be enormously rich. The marriage in every respect proved unfortunate. Her husband treated her harshly, and soon afterwards, becoming bankrupt, was thrown into prison. Malibran immediately abandoned to the creditors the provision that had been made for her by the marriage settlements; and separating from her husband, returned to Europe. In 1828 she appeared at Paris in the opera of "Semiramide." Her success was immense. She became an equal favourite at the London Italian Opera, where she appeared on the 21st March, 1829, and during the season played a wide range of characters—Desdemona, Rosina, Semiramide, Ronce, Tancredi, Ninetta, and Zerlina. Mr. Brown, the lessee, paid her £125 a night in advance—a larger sum in those days than it would be now. She visited occasionally the great towns of the Continent, but from that time to the day of her death she remained the idol of the British public, who admired not only the depth and extent of her passionate genius, but the force and purity of her moral character.

The incidents of a successful artist's career are neither many nor interesting. We pass on to her melancholy end, which was undoubtedly hastened by her incessant labour. In March, 1836, having been regularly divorced from M. Malibran, she married the celebrated violinist, De Beriot, and after a brilliant season of English operatic performances at Drury Lane, repaired to Manchester in September to fulfil an engagement at the great festival. Worn out with her long-continued exertions, and aware that repose was absolutely essential to her health, she could not consent to disappoint the public, and sang at the morning and evening concerts of Wednesday, the 14th September, with a splendour and power which surpassed all her former efforts. But while the rapturous plaudits of her admirers "rent the air," she lay in a state of syncope from exhaustion. She was bled and removed to her home, where she expired on the 23rd of September, in the twenty-ninth year of her age. Her voice was rather a mezzo-soprano, or even contralto, than a pure soprano. There were many parts where it was exceedingly unequal, but the art of the singer and the genius of the artist surmounted all difficulties. It seems probable that Malibran was the most fascinating singer that the opera stage has possessed. When excited she would improvise passages of the most daring audacity, and the astonishment and delight of her audience were beyond description.

**MALIC ACID** was discovered by Scheele in 1785. It was first obtained from the juice of the apple, from which the name is derived, and in which it occurs together with citric acid. It is widely diffused in the vegetable kingdom, and most of our common fruits contain it. Gooseberries, raspberries, strawberries, the berries of the mountain ash and the barberry, and the stalks of garden rhubarb are all rich in this acid. It is usually made from rhubarb or from the mountain ash berries. It is a colourless acid, crystallizing with difficulty in shining needles. It melts at 83° C. (181° Fahr.), and is deliquescent. It is soluble in alcohol, and very soluble in water. The formula is  $C_4H_4O_6$ . When heated to 180° C. (356° Fahr.) it is converted into malic acid ( $C_4H_4O_4$ ) and fumaric acid ( $C_4H_4O_4$ ), both well-defined crystalline acids and isomeric, each forming a series of salts called respectively malates and fumarates. Nitric acid converts malic acid into oxalic acid ( $C_2H_2O_4$ ); slower oxidizing agents convert it into malonic acid ( $C_3H_2O_4$ ), and reducing agents into succinic acid ( $C_4H_6O_4$ ). Malic acid combines with the alkalis, alkaline earths, and metals, forming a large number of malates. The malate of lead is a characteristic crystalline salt, insoluble in water, and remarkable for its low melting-point, which is below the temperature of boiling water. Most of the malates are soluble in water. Malic acid forms malic ether ( $C_8H_{14}O_5$ ), and by the action of ammonia malamide ( $C_4H_8N_2O_3$ ).

**MALIGNANT**, in the times of the great civil war of the seventeenth century, was the favourite term by which the Puritans designated those cavaliers of the extreme wing of the Royalist party who remained faithful to the king's cause after it had hopelessly succumbed, and against whose lives and property they were as keen as the republicans of the great French Revolution against those of the *Emigrés*.

**MALIGNANT PUSTULE** and **ANTHRAX** are names given to a specific contagious disease affecting horses, horned cattle, and sheep, and which is sometimes conveyed by infection to man. Though it had been long known upon the Continent, its existence was not generally recognized in England until 1863, when it was shown by Dr. William Budd to be identical with certain diseases known under other names, which cause every year a large mortality among English live stock. It appears to be caused by the rapid multiplication within the system of the person or animal affected of the *Bacillus anthracis*, which has been found existing in innumerable numbers in all parts of the body. The spores of the *Bacillus anthracis* have been proved to be very tenacious of life, and though they are destroyed by exposure to a high temperature, they are unaffected by ordinary changes, and are capable of retaining their vitality unimpaired for years. All parts of the bodies of animals dying of this disease are therefore actively poisonous, and are capable of conveying the infection to man (1) by direct inoculation, as in the case of farmers, drovers, butchers, tanners, &c., or (2) by indirect contagion through the hair, wool, or skin, to which wool-sorters, feltmakers, horsehair cleaners, furriers, and tanners are especially exposed. It may also be communicated by the flesh, milk, or butter derived from diseased animals, and even it is said by the bites of flies which have alighted upon the ulcers of animals affected.

In man the disease usually appears in the forms of (1) *malignant pustule* or (2) *internal anthrax*. Malignant pustule generally shows itself at first in the form of a small red point or pimple upon some uncovered part of the body, as the hands, arms, or face, which rapidly increases in size, and in a few hours becomes a large red swelling. A vesicle is formed in the centre, which breaks, yielding a blood-stained discharge, and exhibiting underneath a dark brown or black slough. The attendant swelling then rapidly increases in its extent, and is at the same time accompanied by strongly marked constitutional disturbance, the symptoms being those of general septic poisoning, and

death may occur within thirty or forty hours from the first appearance of the pustule, or it may be delayed for five or six days. The mortality from this disease is probably about 30 per cent., but it varies greatly in different outbreaks. In the early stages of the disease treatment consists in the complete destruction of the sore by excision and cauterization, followed by the application of carbolized dressings. Where the disease has made too much progress to be dealt with in this way, attention must be directed towards maintaining the strength and relieving the pain of the patient.

*Internal anthrax* is generally very sudden in its onset, which is attended by headache, vomiting, rigours, and physical depression, symptoms common to many other acute diseases. The parts of the body locally affected are usually the lungs or the stomach and bowels. When the lungs are chiefly affected the symptoms nearly resemble acute bronchitis or pneumonia, but there is unusual physical depression, and death usually occurs within a short period from the commencement of the attack. In cases where the intestines seem to be the chief seat of the disease the symptoms consist of vomiting, pain in the abdomen, and diarrhoea. This also is an extremely fatal disease, and death is seldom delayed beyond two or three days.

From what has been said the necessity for the complete destruction of the carcasses and hides of all animals affected will be apparent, and the owners of such animals ought to be restrained under heavy penalties from disposing of the carcass or offal in any other way. In the case of imported wool, hair, or hides, thorough disinfection should be practised when these come from any country where the disease is known to prevail.

Among cattle the disease is known in England by the names of Joint Murrain, Black Quarter, and Quarter Evil; in France by the name Charbon; and in Germany as Anthrax or Milzbrand.

**MALINES** or **MECH'LIN**, a large town of Belgium, in the province of Antwerp, 13 miles by railway north of Brussels, and 75 east of Ostend. It is situated on a fertile plain on both banks of the Dyle. The population in 1881 was 42,381. Though a fine town with good buildings, handsome squares, and broad streets, a place of extensive trade, and the centre of the Belgian railway system, it is not a lively place, and is totally destitute of the brisk traffic which enlivens most of the principal Belgian towns. Being the religious capital of Flanders, Malines possesses many antiquities of a sacred character, among the chief of which is the cathedral, dating from 1451, with a tower 370 feet high. The other important buildings are the palace of the archbishop, who is primate of all Belgium, the arsenal, the town-hall, the courts of justice, a Roman Catholic university, and a botanic garden. The town is the residence of a military governor. Mechlin lace, which once enjoyed a high reputation, is still manufactured here, but cannot compete with that of Brussels, and the chief manufactures are fine lace, shawls, felt and straw hats, woollen stuffs, linen, cabinet-work, tobacco, starch, beer, &c. It has an extensive trade in flax, corn, oil, hops, &c., and has a canal communication with Louvain for vessels of 160 tons. As early as the sixth century Malines appears to have been a place of importance and the capital of a lordship. It suffered severely from war, plague, and fire in the middle ages; and in modern times has been repeatedly taken by the Spaniards, Dutch, English, and French.

**MALL** or **PALL MALL**, the name given to those places in London and other English towns where there were formerly alleys for playing at tennis. The word is derived from the mallet with which the ball was struck, and which was sometimes called by the compound name pall-mall, from the Italian *palla*, a ball.

**MALLET, DAVID**, or more properly *Malloch* (1700-65), was a college friend of Thomson the poet, and instrumental in getting him his first tutorship. He assisted

Thomson to write the "Masque of Alfred" in 1740, famous as containing the song of "Rule Britannia." His dramas and his "Life of Bacon" are now forgotten, but his ballad of "William and Margaret" keeps him in remembrance. He altered his surname to Mallet for smoothness' sake.

**MALLOPH'AGA** is a small group of parasitic insects, the bird-lice, which are regarded by some authorities as degraded *Orthoptera*, while others place them near the true lice (*Pediculina*), in the order Hemiptera. The bird-lice agree in appearance and general habits with the lice, but differ in the possession of biting mouthparts. The body is flattened. The antennae consist of from three to five joints. The mandibles are small and hook-like; the maxillary palpi when present are four-jointed, and the labial palpi are two-jointed. The eyes are small and simple. The thorax is narrow, apparently composed of only two joints, and bears no traces of wings. The limbs are short and stout, with two jointed tarsi. The bird lice live among the feathers of birds and the hairs of mammals, and feed on the substance of the hairs and feathers, not on the blood of their hosts, as do the true lice. A great number of animals are infected by these parasites, each species of which has a distinct host. *Trichodectes canis* lives on the dog, and another species of the same genus on the cat; while the fowl, crow, and other well-known birds have had various species of bird lice ascribed to them.

**MAL'LOW** (*Malva*) is a genus of plants belonging to the order MALVACEÆ. The calyx is five lobed, with an outer calyx of three parts; there are numerous one-seeded carpels, arranged in a ring round the axis, which become detached when ripe.

The Common Mallow (*Malva sylvestris*), the French Mauve, is very common by roadsides in the British Isles and Europe. The stem is 2 to 4 feet high, with large bluish-red flowers, leaves with crenate lobes, and glabrous fruit. A decoction of the leaves is used in dysentery, and a poultice as an application to external inflammation. The French prepare a drink, which they call *tisane*, from the dried flowers, and use it for colds, &c. The mucilaginous properties which render it valuable are also found in the Dwarf Mallow (*Malva rotundifolia*), which has a decumbent stem and small purple flowers. Its range extends from the British Isles through Europe to Western Asia. It is cultivated in Egypt for a pot-herb. In the Musk Mallow (*Malva moschata*) the lobes of the leaves are bipinnatifid, the stem 1 to 2 feet high, with large rose-coloured flowers and hairy fruit.

Jew's Mallow (*Corchorus olitorius*) is a plant which supplies part of the JUTE of commerce. It is used as a pot-herb, especially by the Jews in Syria and Egypt, and hence received its name. It is cultivated in tropical countries.

**MAL'LOW**, a municipal borough and market-town of Ireland, in the county of Cork, situated on the north bank of the Blackwater, on the Great Southern and Western Railway, 21 miles north by west from Cork, and 43 miles south from Limerick. A bridge of three arches over the Blackwater connects Mallow with Ballydaheen, which forms part of the borough. The town has a good trade in agricultural produce, but no manufactures of consequence. It was once very famous for its mineral spring, which is reputed the hottest in Ireland. There is a court-house, market-house, union workhouse, a handsome church, Roman Catholic chapel, and chapels for Methodists and Presbyterians. Mallow returned a member to Parliament until 1885. The population in 1881 was 4437.

**MALMESBURY**, a market-town of England, in the county of Wilt, situated in an elevated situation above the Lower Avon, 20 miles N.N.E. of Bath, and 95 miles from London by rail. It is well built, and has a handsome market cross and Saxon nunnery, now the parish church. There is a town hall and several schools, and many of the

inhabitants are employed in ribbon and pillow-lace making, brewing, and tanning. Population, 3133. Malmesbury as a town is supposed to date back to pre Roman times, and its antiquities are of great interest. A nunnery was founded at the close of the sixth century, and other monasteries in the two following centuries. The Danes destroyed the town at the close of the ninth century; but monastic wealth and the beneficence of princes soon restored its prosperity, which it enjoyed almost without interruption till the Reformation. The chief monument of Malmesbury's departed greatness is its abbey, the entire buildings of which, with the church, covered about 45 acres. During the Civil War, when Malmesbury was repeatedly besieged, both by the Royalists and Parliamentarians, the church, the only portion not in ruins, though already partly dismantled, suffered great injury. Malmesbury claims the honour of having given birth to Alhelm and Johannes Scotus, William of Malmesbury, second only to the Venerable Bede among the early historians of England, and to Hobbes, eminent by his metaphysical and political speculations.

**MALMESBURY, WILLIAM OF**, one of the most valuable of our old chroniclers, indeed the only one who almost rises into the historian, is said to have been born in Somersetshire about 1095 or 1096. When a boy he was placed in the monastery whence he derived his name, where in due time he became librarian and, according to Leland, precentor. He declined to become abbot when he was offered the headship of the monastery. His principal writings are—"De Gestis Regum" (the History of the Kings of England), "Historia Novellæ" (the Modern History); and "De Gestis Pontificum" (the History of the Prelates of England), containing an account of the bishops and of the principal monasteries, from the conversion of the English by St. Austin to 1125. These were published by Sir Henry Saville among the "Scriptores post Bedam" (folio, 1596; reprinted, folio, Francof., 1601). English translations of these and of some of his other works have been published. He is believed to have died about 1142, for he was continuing his chronicle year by year. His last words are, after describing the Empress Matilda in white surcoats across the ice, unseen by Stephen's soldiers, from Oxford to Wallingford—"This I purpose describing more fully, if by God's permission I shall ever learn the truth of it from those who were present." As he wrote no more the inference of his death seems plain.

**MALMO**, a strongly fortified town in the Swedish division of Malmölan, is situated on the widest part of the Sound, nearly opposite the town of Copenhagen, on level ground. The town is well built, and has regular streets. In the middle is a fine square, 166 yards long and 144 wide. Malmö has been very much enlarged of late years, as it forms a very convenient port for one of the most fertile districts in Sweden. Cloth, stockings, hats, gloves, carpets, soap, leather, starch, and looking-glasses are made. The harbour will admit vessels drawing 18 feet of water.

**MALMSEY** (so called from having been first made at Malvasia in the Morea), a luscious and high-flavoured wine made in the island of Madeira from grapes of a peculiar kind, which are suffered to attain the last stage of ripeness before they are gathered. Malmsey wine has much body, and will retain its good qualities for a long time. When newly made, Malmsey Madeira is of the same golden hue as the ordinary wine of the island, but its colour is materially deepened by age. It contains from 16 to 17 per cent. of alcohol. Malmsey wine is also made in the island of Tenerife, but the quality is greatly inferior to that of Madeira.

**MALORY, SIR THOMAS** (1430-90), is noteworthy as the author of that compilation from the poems and romances of Walter Map, Geoffrey of Monmouth, and the

rest of the Arthurian chroniclers, which has fixed the general form of the legend of the Round Table. This book, the "Morte d'Arthur," appeared about 1465.

**MALPIGHI, MARCELLO**, a celebrated Italian anatomist, and one of the first to apply the microscope to the study of animal and vegetable structure, was born near Bologna, 10th March, 1628. He studied medicine in the University of Bologna, and received his degree there in 1653. He successively filled the chairs of medicine at Bologna, Pisa, Messina, and again at Bologna, remaining at the latter twenty-five years. In 1691 he was appointed private physician to Pope Innocent XII., and he died at Rome, 29th November, 1694.

Malpighi ranks very high among the philosophers of the physiological age in which he lived. He had early in life learned the necessity of making experiment the foundation of true philosophy, and several striking discoveries were the result. The chief of these relate to the anatomy of the skin, the kidney, and the spleen, certain portions of which are still called after his name. He appears also to have been the first physiologist who observed the capillary circulation of the blood by means of the microscope, and on the subject of vegetable histology he showed himself to be an original as well as a profound investigator. He was the author of numerous important treatises upon the subjects of his research, and the greater portion of these were republished in one edition in London, in 1687, in two vols. folio, with portrait and plates. His posthumous works were also published in London in 1697.

**MALPIGHIA CEE** is an order of plants belonging to the Geniæ among the POLYPERALÆ. The species are trees or shrubs, often climbing, natives chiefly of tropical countries, especially of South America. The fleshy fruit of species of the genus Malpighia are eaten in the West Indies under the name of Barbadoes Cherry. This genus and Barteria are cultivated in our hothouses. The calyx is deeply divided into five lobes, all of which, or only four, have two glands on the outside; there are five petals, an inconspicuous disc, ten stamens; carpels distinct, or more or less connate, into a three-celled ovary; styles three, distinct; ovules solitary in each carpel, attached to a broad pendulous stalk, with the raphe ventral; the seeds are exalbuminous; the leaves are generally opposite, entire, and stipulate.

Many of the climbing species have stems with several woody axes, surrounded by a common bark, and finally separated more or less from one another.

**MALPLAQUET**, a village in France, department of the Nord, 16 miles N.N.W. of Avesnes. It is only remarkable as the scene of the great battle, 11th August, 1709, in which Marlborough and Prince Eugène defeated the French under the Marshals Villars and De Boufflers. The allies mustered 95,000 men, with 105 guns; the French 95,000 men, with eighty guns; but the latter were very strongly posted on a range of wooded heights, bristling with redoubts and palisades, stockades and abatis, which were only approachable by two defiles, locally called *Trouées*, and these completely under fire. By means of repeated and desperate charges, combined with a formidable attack in the rear, Marlborough succeeded in forcing the enemy's lines, and compelling them to retreat upon Bavai. This success, however, was dearly purchased; the allies lost 5544 killed, and 12,706 wounded or missing; the French, about 14,000.

**MALSTROM.** See MÆLSTROM.

**MALT** is grain, usually barley, which has become sweet and more soluble in water from the conversion of its starch into sugar by artificial germination to a certain extent, after which the process is stopped by the application of heat. The derivation of the term is from the Old English *mealt*, which in its turn comes from *mealt*, the past tense of the verb *mellan*, to melt, hence to soften, whether by heat or

by steeping. The noun *malt* meant usually something steeped. The making of malt, called *malting*, is thus conducted:—

The barley is steeped in cold water for a period which (as regulated by the old law) must not be less than forty hours; but beyond that period the steeping may be continued as long as it is thought proper. Here it absorbs moisture, and increases in bulk; at the same time a quantity of carbonic acid is emitted, and a part of the substance of the barley is dissolved by the steep-water. One hundred bushels of grain, after being steeped, swell to the bulk of 120 bushels, and increase 47 per cent. in weight; and the quantity of water which the steep water holds in solution varies from one-fiftieth to one-hundredth of the weight of barley. It consists chiefly of an extractive matter of a yellow colour and disagreeable bitter taste. After the grain has remained a sufficient time in the steep the water is drained off, and the barley thrown out of the cistern upon the malt-floor, where it is formed into a heap called the *couch*, about 16 inches deep. In this situation it is allowed to remain about twenty-six hours. It is then turned by means of wooden shovels, and diminished a little in depth. This turning is repeated twice a day or oftener, and the grain is spread thinner and thinner, till at last its depth does not exceed a few inches.

When placed in a couch it begins gradually to absorb oxygen from the atmosphere, and to convert it into carbonic acid, at first very slowly, but afterwards more rapidly. The temperature, at first the same as that of the external air, begins slowly to increase; and in about ninety-six hours the grain is at an average about 10 degrees hotter than the surrounding atmosphere. At this time the grain, which had become dry on the surface, becomes again so moist that it will wet the hand, and exhales at the same time an agreeable odour, not unlike that of apples. At the time of this moistening, which is called *swelling*, the roots of the grains begin to appear, at first like a small white prominence at the bottom of each seed, which soon divides itself into three rootlets, and increases in length with very great rapidity, unless checked by turning the malt. About a day after the sprouting of the roots the rudiments of the future stem, called the *aerospire* or plumule, may be seen to lengthen. It rises from the same extremity of the seed as the root, and advances within the husk towards the opposite end; but the process of malting is stopped before it has made much progress. Even if the germination were not stopped the plumule would not pierce that end, but would return to the other end, doubling on itself.

As the aerospire shoots along the grain the appearance of the kernel, or merely part of the corn, undergoes a considerable change. The glutinous and mucilaginous matter is taken up and removed, the colour becomes white, and the texture so loose that it crumbles to powder between the fingers. The object of malting is to produce this change: when it is accomplished, which takes place when the aerospire has come near to the end of the seed, the process is stopped by drying the malt upon the kiln. The temperature at first does not exceed 90 degrees; but it is raised very slowly up to 110 degrees or higher, according to circumstances. The malt is then cleaned, to separate the rootlets, which are considered injurious. The subsequent processes of brewing and distillation of spirits are described in the articles BREWING and DISTILLATION.

In brewing ale, porter, and table-beer three different kinds of malt are employed, which are known as pale or amber, brown, and black or roasted malt—sometimes called patent malt (patented by Daniel Wheeler in 1817). The pale or amber malt yields the saccharine or fermentable extract; the brown malt is not fermentable, but is used to impart flavour; and the roasted malt is employed, instead of burnt sugar, merely to give colouring matter to stout and porter. In the brown and roasted malts the

sugar appears to be entirely converted into gum and colouring and extractive matters; and hence they are incapable of undergoing fermentation. The brown malt is subjected to a higher temperature in drying than the pale malt, and by a still further exposure to heat in revolving cylinders or roasters it is converted into black or patent malt.

Up to 30th September, 1880, no raw grain was permitted to be used in the brewing of beer in this country, and this material, if found on a brewer's premises, rendered him liable to a heavy penalty under the then existing excise laws. On the 1st October, 1880, the new Beer Act (introduced by Mr Gladstone's government), allowing brewers to mix raw grain with malt for the production of their "worts," came into operation, and since that date brewers have been attempting to make use of this permission, the inducement being the great difference in commercial value between raw and malted grain. The most natural grain to employ as a partial substitute for the more expensive "malt" was barley, but maize and rice have also been experimented with for this purpose. It was, however, soon found that raw grain *per se* was unfitted for use in the mash tun, without some previous preparation to fit it for the brewing of beer, and several patents have been taken out to effect this object. The most noteworthy among these are Gillman & Spencer's for the treatment of rice, and Fordred's patent for the treatment of barley, both of which are coming into extensive use; by the Fordred system barley of any description can be perfectly fitted for use in the mash tun in the short space of two minutes, whereas malting it in the usual way would occupy fourteen days. The Fordred system is one of torrefaction, and the commercial article is designated "white malt." A mixture of about 25 per cent. of torrefied barley (or other grain) with malt is found to give as valuable a wort as one prepared from malt alone, and of course at a considerably reduced price. Torrefied barley has one great advantage over "gelatinized rice," namely, that the "grains" or spent malt is still available. This, as a valuable cattle food, is a source of income to the brewer, and is entirely lost by the use of gelatinized rice.

Formerly an excise duty was levied upon all malt made in the United Kingdom, but in 1880 this was abolished in favour of a tax upon beer by the Inland Revenue Act 43 & 44 Vict. c. 20. Its removal had long been urged by agriculturists, who alleged that it operated injuriously on the cultivation of barley, and hindered the use of malt for the feeding of cattle, ewes, &c. The repeal of the duty, however, has been found in actual experience rather hurtful than beneficial to the farmers. So long as it was charged upon the malt it was the interest of the brewers to use the finest and heaviest grain that could be procured, a circumstance which greatly favoured the British grower; but when the duty was removed from the malt and placed upon the beer, the brewer was left free to use barley of any quality, or to substitute other kinds of grain, maize, or sugar. Up to the present, however, the British brewers rely chiefly upon malt prepared from barley and upon sugar, and malt is the raw material from which the whisky of Scotland and Ireland is principally distilled. It is also the source from whence the greater part of the best qualities of table and pickling vinegar is derived, and an extract of malt, prepared by concentrating an infusion, enters into a number of medicinal preparations. In America this extract is considered to possess great dietetic value, and in England malt has been introduced with success in combination with various kinds of farinaceous meal as food for infants.

**MALTA.** The Maltese Islands, in the Mediterranean, lie between 35° 49' and 36° N. lat., and 14° 10' and 14° 36' E. lon. Malta is 58 miles from the nearest point of Sicily, and 179 from Cape Demas, the northern point of Africa. Its greatest length is 17 miles; its greatest breadth, 9 miles. The distance by sea from Plymouth

is 2020 miles; from Marseilles, 650 miles; from Alexandria, 820 miles. The population in 1881 was 149,782, of whom 1346 (exclusive of British troops and their families) were British residents. The population increases at the rate of 1000 a year, while of real emigration there is none; as many almost return each year from the African coast as leave Malta for it, and the difficulty of providing for the surplus population is a constant source of anxiety to the authorities. The present number of inhabitants (exclusive of the troops) gives an average of 1330 to the square mile.

The small islands of Gozo, Comino, and Filfla belong to the group of the Maltese islands. Gozo is 10 miles long by  $5\frac{1}{2}$  wide. In the centre of the island is a ruinous castle, at the foot of which is a populous town, called the Rabbato. The other two islands are much smaller.

The annual revenue of Malta is about £180,000, and the expenditure often somewhat less than that amount. The total military expenditure, defrayed by the English government, for the defence of the island is about £400,000 per annum, of which only £5000 is provided by the island authorities. Malta contains two principal ports, on the south-east side of the island, which are separated by a tongue of land  $1\frac{1}{2}$  mile long, on which are built the Castle of St. Elmo and a lighthouse, commanding the entrance to both ports. This tongue of land is 200 feet above the level of the sea, but declines towards the point, and is almost flat at the part where it joins the mainland. On this advantageous position is built the modern city of Valetta, which is the seat of the government and the citadel of the island. It is so strongly fortified as to render Malta almost impregnable. The whole works have embrasures and accommodation for upwards of 1000 guns.

The great harbour, which is to the eastward of Valetta, is about 3400 yards in length, with an entrance 450 yards wide, defended by a strong fort opposite the Castle of St. Elmo, called Ricasoli, which crosses its fire, but is commanded by that castle. The harbour varies in width from 150 to 700 yards, and is surrounded by all the requisite buildings for a naval arsenal; it is one of the finest ports and naval stations in the Mediterranean. There are three graving or dry docks—the third having cost £120,000. It is about 475 feet long, 102 feet wide at the top, and 80 feet across at the entrance. The excavation was made in a rock, the original surface of which was 50 feet above the sea, so that altogether a depth of 91 feet had to be reached before the masonry was commenced. In 1859 an arm of the harbour adjoining the dockyard was taken by the government for the extension of the naval works; but as this was formerly occupied by merchant shipping, the authorities agreed to provide an equivalent by adding 60 acres of water space to the great harbour, and by constructing a new wet dock of 9 acres, with ample wharves, &c.

The scene on entering the port of Malta is one of the most striking and beautiful that can be conceived. This magnificent harbour is surrounded with bastions, over which appear handsome buildings and the towers of numerous churches, all built of stone, and presenting the cleanest and most brilliant appearance. On one side stands the city of Valetta, towering above the harbour; on the other the three cities of Vittoriosa, Cospicua, and Senglea (commonly called the Borgo, Burniola, and Isola), which in fact form one continued town, covering the two spits of land which project from the eastern side of the harbour like pointing fingers, and forming the inlets or coves already mentioned. Valetta and these three cities compose the capital of Malta. The eastern part of the island is separated from the western by a ridge of land which crosses to the westward of Valetta, and forms a natural fortification. The island is thus divided into two parts, of which the eastern contains the ancient capital and twenty-two casals or villages. Città Vecchia, or the old city, as it is commonly called, but the proper name of which is Città Notabile, is situated

on a rising ground in the interior of the island, about 6 miles from Valetta, and was, before the foundation of the latter city, the capital of the island. It is still the seat of the bishopric, and contains the cathedral, a handsome modern edifice, built on the site of the ancient church. The city is walled, but is of no importance as a fortification. It contains many good and even magnificent buildings, but, with the exception of two large convents, the population is very small. A populous suburb, called the Rabbato, is inhabited by the dependants of many convents and ecclesiastical establishments in the neighbourhood, and by a large agricultural population. There are extensive catacombs cut in the calcareous rock. The parish churches of the casals are large and magnificent: they are built of the stone of the island, and being isolated, and well situated in the centre of the habitations, display their architecture to advantage. Malta is chiefly supplied with water by rain, carefully preserved in tanks; but there is a magnificent aqueduct,  $8\frac{1}{2}$  miles long, which brings water to Valetta from a spring.

The surface of Malta and Gozo is estimated at 111 square miles, or 72,960 acres, of which about two-thirds are cultivated and the remaining third is bare rock. There is much good native earth in the valleys, which have been converted into productive fields; but a great portion of the land has been brought to its present state of culture by the industrious native, who with great labour and expense cuts away the hard surface of the rock, and frequently finds a quantity of soil in the crevices and interstices beneath. The produce of Malta is cotton (which is its staple), wheat, barley, pulse, potatoes, barilla, cummin seed, and salla, or the French honeysuckle, which is used for fodder. As there is no meadow-land, much barley is cut when green for draught animals; and the straw (which is very fine) is a good substitute for hay. The garden flowers are unequalled anywhere for their delightful fragrance, and there is a large produce of the finest honey. The manufactures are cabinet-work, jewelry, soap, leather, and coarse cottons. There are no wild animals in the island, and, from the scarcity of pasture, very few cattle are bred. The discovery, however, of the bones of two species of pigmy elephants, which would have been 4 or 5 feet and 2 or 3 feet high respectively, in deposits of post-pliocene age, proves that at a comparatively recent time Malta must have been connected with a continental area. Meat is principally imported from Barbary. Horses are also imported, but some mules are reared, and the asses of Malta and Gozo are much prized, as are also the goats.

The roads in Malta and Gozo, generally speaking, are good, and communicate with all parts of each island. The inland modes of transport are by single-house carts, and by horses, mules, or asses of burden. A railway has been constructed from Valetta to Città Vecchia.

These islands enjoy an excellent climate. Its worst feature is the peculiar shocco wind which prevails for a few weeks in autumn. Malta is eminently fitted for the residence of English invalids from the beginning of October to the end of May.

The natives of Malta are a dark-skinned athletic race, and on that account, and from their Arabic dialect, have often been considered of African origin; but we look in vain for the Arab features. They are hardy and robust. The great bulk of the people, who are employed in field-labour, are stone-cutters. The Maltese are also excellent seamen, and are esteemed as such in all the ports of the Mediterranean. A *patois* compounded of Arabic, Italian, and other dialects is the popular language, in which the former element so far preponderates that it is said to be intelligible to natives of the opposite shores of Africa. Pure Italian is spoken by the upper and mercantile classes, but a knowledge of English is becoming prevalent, promoted by schools under English direction. There are



a university and a high school for the children of the upper classes, and many primary schools. The religion of the people is the Roman Catholic. The clergy and chapels are numerous. The Protestant clergy and places of worship (consequent on the occupation of the island by the English) are much fewer in number.

Malta is a crown colony, and the local government is conducted by a governor, whose official salary is £4500 per annum. In legislative matters he is assisted by a council of seventeen persons—nine officials and eight elected by the people. The courts of justice are numerous, and the procedure has been condemned as intricate and costly.

*History.*—The earliest notice of the Maltese Islands is in Diodorus of Sicily (v. 12), in which he says that Malta was in a Phœnician colony. It is supposed to have been afterwards occupied by the Greeks. The Carthaginians obtained possession of it in 402 B.C., and the Romans in 242 B.C. The Arabs seized it in 870; but in 1120 Count Roger, the Norman conqueror of Sicily, took possession of Malta, and expelled the Arabs. Malta was thus attached to the island of Sicily, and it became subject to the different dynasties which successively governed that island.

In 1516 Sicily, with the Maltese Islands, passed to the Emperor Charles V., as heir to the crown of Aragon. On the 4th of March, 1530, Charles granted to the grand-master and religious fraternity of St. John, who had recently been expelled from Rhodes by the Turks, the ownership of all the castles, fortresses, and isles of Malta and Gozo, with complete jurisdiction. The sovereignty of Malta was by this grant in effect surrendered to the knights, though the form of tenure from the crown of Sicily was maintained by the reservation of the annual payment of a falcon to the King of Sicily or his viceroy. The knights built formidable defences, and speedily improved the condition of the island. On the 9th of June, 1798, the French expedition to Egypt under Bonaparte, consisting of eighteen ships of the line, eighteen frigates, and about 400 transports, having 40,000 men on board, arrived off the island. Previous secret arrangements with the grand-master, Ferdinand Hompesch, and the French knights of the order, led to the surrender of Malta to this force, although it was amply fitted for defence. The French government soon became so oppressive that the Maltese revolted, and they besieged the fortified cities from September, 1798, till September, 1800, while a blockade was kept up by sea by the Sicilians, Portuguese, and English. Captain Alexander John Ball, who commanded the squadron afterwards appointed by Lord Nelson to besiege Valetta, was in the beginning of 1799 elected by the Maltese as their chief and the president of their congress. At length General Vaubois made proposals to surrender the place into the hands of the English troops. This act was signed and concluded on the 5th of September, 1800.

At the peace of Amiens in 1802, it was settled between Great Britain and the French Republic that the island should be restored to the Knights of St. John, and be an independent state as formerly, but with some modifications. Other political events prevented the fulfilment of this plan; and England remained in military possession of Malta till 1814. This was a period of great prosperity to the island, with the exception of a serious visitation of the plague in 1813. On the 30th of May, 1814, a definite treaty of peace, concluded at Paris between France and the allied powers, fixed the lot of Malta by a formal recognition of its subjection to the crown of Great Britain. But as the cessation of the war opened the ports of Europe, Malta lost much of her recently acquired prosperity. As a military and naval station, it has ever since been kept up with great care; and as a dependency or colony of England, many improvements in the internal government have been made since 1840. The headquarters of the Medi-

terranean fleet, and a depot on the route to India, its political importance is very great. A bay on the east coast, near Valetta, has been shown to be the scene of the shipwreck of St. Paul.

**MAL'TA, KNIGHTS OF.** See JOHN OF JIRESALEM, KNIGHTS OF.

**MALTESE DOG** is a small dog of the spaniel kind. It has a long body, short legs, and long silky hair, which is generally of a pure white colour, or sometimes yellowish. It is extremely small, and fit only for a lap dog. The breed is very ancient, as it is mentioned by Strabo (A.D. 25) as *Canis militans*.

**MAL'THUS, THOMAS ROBERT**, a celebrated political economist, and founder of a theory concerning the principle of population, since called, after him, the Malthusian theory, was born in 1766, at the seat of his father, the Rectory, near Dorking, Surrey. The elder Malthus, a gentleman of fortune, was a personal friend of Rousseau, and he took a great interest in all social and historical problems. He gave his son a liberal education at home, and in 1781 sent him to Cambridge, where he was ninth wrangler, and became fellow of Jesus College in 1797. The same year he received orders and took charge of a small parish in the neighbourhood of his birthplace, retaining at the same time his fellowship. He had been in the habit of conversing with his father on the subject of the perfectibility of mankind, and in one of these conversations he raised a series of objections to the theories of Condorcet and Godwin, based upon the tendency of the human race to increase its numbers beyond the available means of subsistence. At his father's request he committed his views to writing, and in 1798 he published the first edition of his great work, entitled "An Essay on the Principle of Population as it affects the Future Improvement of Society." In the following year he made a tour of Northern Europe in search of data, and afterwards took advantage of the peace of Amiens to visit France and Switzerland. The results of his further studies and investigations were embodied in a greatly enlarged and improved edition of his work, which appeared in 1803. In 1805 he married, and shortly afterwards was appointed professor of political economy and modern history in the East India Company's College at Haileybury, and he performed the congenial duties of this post with great success until his death, which took place 29th December, 1834. He was one of the founders of the now extinct Political Economy Club, and of the still existing Statistical Society. In his private life he was a man of most exemplary character, and confident in the benevolence and purity of his intention and the soundness of his theory, he bore uncomplainingly the storm of obloquy and misrepresentation to which he was exposed.

In the matured editions of his essay he enforced, with much illustration and many arguments, the theory that while population has a tendency to increase in a geometrical ratio, the means of subsistence can hardly, under favouring circumstances, be increased in a greater than an arithmetical ratio. He also pointed out that the problem of preserving the balance between food and population had always been a pressing one, and that it afforded a key to much of the war and suffering which forms so prominent a feature in all ancient history. The checks upon the undue increase of population he considered might all be included under the three headings of moral restraint, vice, and misery, and he urged that if the first of these was rightly understood and practised the problem of the population would be solved. The one precept enforced by him was, "Do not marry until you have a fair prospect of supporting a family." In the present condition of the world the alternative of emigration to limitation is certainly open to European peoples at least, but there is no doubt that the population question will have to be considered sooner or later in connection with the social arrangements of man-

kind. The modern advocates of the Malthusian theory have, for the most part, been more disposed to rely upon other methods for preventing the increase of the population than that advocated by Malthus, but for this he cannot in fairness be held responsible. At present France is the only European country where the increase of the population is systematically restrained or prevented. See "Malthus and his Work," by James Bonar (London, 1885), in which the views of Malthus are very clearly interpreted to the present generation.

**MAL'TON**, a town of England, in the county of York, situated on the right bank of the Derwent, with a station on the York and North Midland Railway, 18 miles N.N.E. of York and 212 miles from London. The town is prettily situated upon the sloping bank of the river, and consists of some fine streets, and has some good buildings, among others St. Michael's Church, St. Mary's Church, in Old Malton, with a fine Norman doorway, a large market-place, town hall, a mechanics' institute, public library, and some good schools. It has a large river trade in agricultural produce and provisions. Old Malton, distant about a mile, is now noted for its antiquity and its lime quarries. There was a Roman station at Malton in the time of the Romans, and near the bridge stand the remains of a castle, built by the Vesey family, and destroyed by Henry II. The population in 1881 was 8750. It returned a member to the House of Commons until 1885.

**MAL'TOSE**, a sugar obtained by the action of diastase or infusion of malt on starch. It resembles glucose, and is converted into it by boiling with dilute acids; but it has a dextro rotatory power three times as great. The formula is  $C_6H_{12}O_6$ .

**MALVA'CEÆ** is a large order of plants belonging to the POLYPERMALÆ, cohort Malvales. A large proportion of the order consists of herbaceous or annual plants, inhabiting all the milder parts of the world, but much the most plentiful in hot countries, where alone a comparatively small number of species become trees. In many cases they are remarkable for the large size and beautiful colours of their flowers, which are, however, fugitive. Among the very numerous species several are of essential service to man. As emollients they are well known in medical practice, the Marsh Mallow (*Althæa officinalis*) being one of the most useful among this kind of remedial substances, and a large proportion of the whole order being capable of supplying its place. The hairy covering of the seeds of the various species of *Gossypium* forms the raw cotton so important to our manufacturers. The seeds of *Hibiscus Abelenoschus* are warm and musky, and are employed in perfumery as a substitute for musk; those of *Hibiscus esculentus* are used in hot countries as a mucilaginous ingredient in soups. A few species are acid, especially *Hibiscus Sabdariffa*. The tenacious fibres procured from the inner bark of many kinds of malvaceous plants are formed into cordage. *Hibiscus cannabinus* and *Hibiscus tiliaceus*, and several kinds of *Sida*, are principally used for this purpose.

The following are the general characters of the order:—The calyx consists of five valvate sepals; there are five petals; numerous monadelphous stamens with one-celled anthers; ovary with two or several cells, the carpels being arranged in a ring round the axis; the leaves are alternate and furnished with stipules. See MALLOW, ALTHÆA, BOMBACEÆ, HIBISCUS, COTTON.

**MALVERN or GREAT MALVERN**, a town of England, in the county of and 8 miles south-west from Worcester, and 128 from London by the Great Western Railway, is situated on the eastern side of the Malvern Hills. It is a favourite watering-place, and is much resorted to by invalids, not only for its chalybeate and bituminous medicinal springs, but for the salubrious of the situation. The wells are between Great and Little Mal-

vern, the latter a small village about 3 miles to the south. Great Malvern is neatly built, and contains a fine church, originally part of a monastery that was founded in the reign of Edward the Confessor. There are chapels for all denominations of dissenters. The town also has good hotels and substantial private residences for visitors, besides some large establishments for the practice of hydropathic treatment. Malvern Proprietary College, erected in 1865, is an elegant building 210 feet long, with central tower 100 feet high, and accommodation for 600 boys. In the centre of the town are large promenade gardens. The hills close by command a magnificent view. The population of Malvern in 1881 was 5847.

**MALVERN HILLS**, a range of hills in England, which forms the boundary between the county of Worcester and the counties of Monmouth and Hereford, nearly 10 miles from north to south; highest summit, the Herefordshire Beacon, 1444 feet high. They are composed of an axis of syenitic rocks with new red sandstone on the east, and Silurian strata on the west, uplifted by the syenite.

**MAM'ELUKES.** See MEMLUKS.

**MAMMALIA** is the highest class of the subkingdom VERTEBRATA, including most of the animals popularly known as quadrupeds or beasts, though neither term is exactly synonymous with mammal, both being equally applicable to the larger reptiles. Man and the whales, though true mammals, do not come under the category of quadrupeds, and the bats would likewise be probably excepted.

Mammals are warm-blooded vertebrates, breathing by means of lungs, the cavity containing which is separated from the visceral cavity by a muscular diaphragm which is the chief agent in respiration. The heart has four chambers, and there is a complete double circulation of the blood. The skull articulates with the vertebral column by two condyles, and the lower jaw is attached to the skull without the intervention of a quadrate bone, as in birds and reptiles. The skin is more or less covered with hair. The young are born alive, and are nourished for some time after birth by the secretion of the mother's mammary glands.

Though the majority of the Mammalia live on the surface of the earth, there is great variety as regards habitat in this class. The mole in its subterranean burrows, the sloth passing all its life amidst the boughs of trees, the bat with powers of flight as well developed as in birds, and the whale finding as permanent a home in the water as any fish, all present stranger contrasts than can be found in any other class of the vertebrate subkingdom.

The body of a typical mammal presents a distinction into head, neck, and trunk, the last being further divisible into thorax and abdomen. The hinder part of the body is usually prolonged into a tail, which varies in usefulness from the "fifth hand" of the American monkeys to the mere stump of the higher apes. The tail often forms a fly-flap for brushing away insects from the skin, as in the giraffe and many herbivorous mammals; in the whale it forms a powerful swimming organ; in the beaver it is flattened and covered with scales, so as to form a trowel-like organ for the construction of its dam and lodge; while in the kangaroo it forms, together with the hind limbs, a firm tripod on which to rest.

The external surface of the body is more or less thickly covered with HAIR, a modification of epidermis similar in origin to feathers, the covering of birds. The hair of mammals is of various kinds, distinguished by the names fur, wool, bristles, spines, &c. It is sometimes scantily developed, as in the whales and their allies, where it is limited to a few small bristles on the lip, often only present in the young or even fetal condition. In the hippopotamus minute hairs are thinly scattered over the greatly thickened skin. Hairs are either temporary, shed every year, or persistent; the hair on the body of the horse is an example of the first kind, that on the mane and tail of the

second. In some mammals, as the ermine and Arctic fox, which inhabit countries covered with snow in winter, the hair undergoes a change to white as that season comes round. Horny, imbricated scales, like those occurring in reptiles, are only found in the pangolin (*Manis*) covering the whole body, and with them are associated hairs. On the tail of the beaver, and of the flying squirrels of the genus *Anomalurus*, scales are also present. Except in the whales and other cetaceans the tips of the extremities of both limbs are protected by epidermic structures similar in their constituents to hairs, and called according to their shape claws, hoofs, and nails, the last of which is peculiar to the order Primates (man, monkeys, and lemurs). The bats have only claws on the thumbs. The horns of cattle and other ruminants, as well as those of the rhinoceros, are also of epidermic origin. The antlers of the deer, on the other hand, consist of true bone. The cutis, or true skin, is often greatly thickened, and in the armadillos becomes ossified, bony plates being developed and covered with a layer of horny epidermis.

All mammals possess a well-developed osseous internal skeleton. The skeletons of typical members of the class are shown in the accompanying Plates for comparison; the letters in all cases refer to the same parts. The mammalian SKULL presents certain very distinctive features. The bones building it up are immovably connected with one another, and their sutures or articulations tend to become obliterated in old age. It articulates with the vertebral column by means of two condyles, in the formation of which the ex-occipital bones take part. In the presence of two occipital condyles the mammals agree with the Amphibia, and differ from birds and reptiles, which have only a single condyle. Within the auditory capsule of the mammalian skull are three small bones, which are the homologues of much larger bones in the lower vertebrates connected with the visceral arches, and fulfilling in them more important functions. These bones are the malleus, incus, and stapes, the first two of which are generally considered to represent respectively the quadrate and articular bones, which are portions of the primitive first visceral arch; while the stapes is the rudiment of the upper portion of the second or hyoid arch, and so is homologous with the hyo-mandibular of fishes. Thus the quadrate bone, which in birds and reptiles forms the union between the skull and the lower jaw, is in mammals sunk into the auditory capsule, and the lower jaw articulates with the skull by means of a cranial bone, the squamosal. The two halves of the lower jaw consist each of a single bone.

The vertebral column [see BACKBONE] consists of a series of separate bones or vertebrae. These bones, though closely bound together by interposed fibrous tissue, are quite distinct, and have a certain power of movement, one upon another, except in the region where the pelvic girdle joins the vertebral column, where two or more vertebrae are ankylosed together to form the sacrum. In all mammals, except the monotremes, the body of the vertebra has a thin osseous disc at each end, termed an epiphysis, which is separable on maceration. The cervical vertebrae, or those forming the region of the neck, are remarkably uniform in number throughout the class, though the actual length of the neck may vary enormously, from that of a man to that of a giraffe. To the number of seven cervical vertebrae there are only three exceptions, the manatee and two-toed sloth, which have six, and the three-toed sloth (Plate, fig. 2), which has nine. Except in the giraffe and llama, and in macrauchenia, an extinct South American perissodactyle ungulate, the transverse processes of the cervical vertebrae are perforated for the passage of the vertebral artery. In certain species of whales and armadillos the cervical vertebrae are more or less blended together. The dorsal vertebrae, or vertebrae of the back, consist of the vertebrae succeeding those of the neck, and differing from them in

having movable ribs, which are attached below to the sternum or breastbone. Following these come the lumbar vertebrae, which bear no movable ribs. The sacrum consists of two or more vertebrae following the lumbar region, which are ankylosed together to form a single bone. In those Mammalia in which the hind limbs are absent the sacrum is also absent. The termination of the vertebral column is formed by the caudal vertebrae, which dwindle in size towards the extremity, where the centrum or body of the vertebra is alone represented. The caudal vertebrae vary greatly in number, from forty-six in the long-tailed pangolin to the four ankylosed vertebrae forming the *os coccygis* of man. In many mammals articulated to the under surface of the caudal vertebrae are the chevron or V-shaped bones, which serve to protect the bloodvessels of the tail.

The sternum or breastbone is generally made up of a series of bones placed one after the other, and connected with the vertebral column by the ribs, which each sternal bone gives off on each side. The form of the breastbone is affected by its relations with the shoulder-girdle. Its anterior portion, the pre-sternum or manubrium, is connected with the clavicles or collar-bones, when present, and in bats and the mole has a prominent keel developed upon it like that of birds. The sternum, though composed of distinctly segmented bones, ossifies from a continuous unsegmented cartilage.

The movable ribs are long, narrow, curved bones, which articulate by their heads with the bodies of two of the dorsal vertebrae, and are usually supported by a tubercle against the transverse process of the hinder of the two vertebrae. The anterior ribs (true ribs) curve round the body, and reach the sternum; but the posterior either touch the edges of the ribs in front of them (false ribs), or hang quite freely (floating ribs); in man seven pairs are called true, three false, and two floating.

Two pairs of limbs are present in all the Mammalia, though in the Cetacea and Sirenia the hind limbs are in an extremely rudimentary condition. The shoulder-girdle, which supports the anterior limbs, is present in a modified and somewhat rudimentary condition. Its upper portion, the scapula or shoulder-blade, is largely developed, while the coracoid portion forms only a small process which becomes ankylosed with the scapula and lies in front of the glenoid cavity. In the lowest mammals, however, the Monotremata, a well-developed coracoid articulates with the sternum, and an epicoracoid is also present in front of it; while a more striking reptilian feature, in connection with the shoulder-girdle of these low mammals, is the presence of a large inter-clavicle, which is a large T-shaped bone lying in front of the pre-sternum and connecting it with the clavicles. In many mammals the shoulder-blades are brought into connection with the sternum by means of the clavicles or collar-bones. The clavicles, however, are only well-developed in those mammals which use the anterior limbs in flight (bats), digging (Insectivora, some rodents), and prehension (Primates); in the Ungulata and Cetacea they are absent, and in the Carnivora they are rudimentary and freely suspended in the muscles. The shoulder-bone or humerus (*u*, fig. 12), forming the upper segment of the fore limb, is usually elongated, but is short and stout in the ungulates and cetaceans. It articulates above with the glenoid cavity of the shoulder-girdle, and below by a hinge-joint with the bones of the forearm. In the mole (fig. 3) it has an additional articulation with the clavicle. The arm, or forearm, is composed of two bones, the radius and ulna (*s* and *r* in figs.), which primitively are quite distinct and placed side by side. The ulna (*r*, fig. 6) forms the hinge-joint of the elbow, and in all mammals except man and the higher apes is produced at this point into a process, the olecranon (*o*, figs. 1, 6). The ulna is in many mammals fused with

the radius, and is quite rudimentary in the bats (fig. 5) and the ruminants (fig. 7). In man, and to a greater or less extent throughout the order Primates, the radius has the power of freely crossing and recrossing the ulna, of *pronation* and *supination*. [See ARM.] This power of rotation is lost more and more in proportion to the use made of the fore limbs in locomotion. Marsupials, as the kangaroos, who progress mainly by means of their hind limbs, have often considerable powers of rotation. The radius articulates with the wrist or carpus (*v* in figs.), which is made up of a number of small bones, varying from five to eleven; in man there are eight carpal bones. To the distal row of carpal bones are articulated the metacarpal bones (*v* in figs.), or bones of the hand, which support the digits (*w* in figs.); the first digit, the thumb or pollex, has two joints or phalanges, the rest have three. Typically, as in man, there are five digits and five metacarpals, but one or more of the digits of the hand may be suppressed through becoming unnecessary for locomotion, and the corresponding metacarpal bones be likewise lost. The first digit to disappear is the pollex, then the fifth digit, corresponding to the little finger of man, next the index digit, and lastly the fourth digit, leaving, as in the case of the horse, only the middle digit. In the horse the second and fourth digits are represented by the splint-bones, which are rudimentary metacarpals. In the pig (fig. 6) there are two functional toes, but the second and the fifth are well developed, though they do not reach the ground. In the sheep and ox the two metacarpals of the functional digits, the third and fourth, are more or less ankylosed into a single long tubular bone, the cannon bone (*v*, fig. 7), and the hoofs of the second and fifth digits alone remain, supported sometimes by rudiments of the terminal phalanges. In animals which walk on the tips of the toes, as the horse, the metacarpus is so elongated that the wrist is commonly mistaken for the elbow, and the arm is thought to have a different flexure from the human. In the bats (fig. 5) the digits of the hand are enormously elongated, and support a membrane which serves as an organ of flight. In many aquatic mammals, as the otter, a web is formed between the digits. In the whales the whole arm is short and paddle-like, the digits are enveloped in a common fold of integument, and consist of numerous phalanges, often as many as ten or twelve.

The hind limbs are very similar in structure to the fore limbs, but they are brought into closer connection with the vertebral column by means of the pelvic girdle. The pelvic girdle consists originally of three bones, ilium, ischium, and pubis, which meet to form the acetabulum, with which the head of the thigh-bone articulates; of these the ilium articulates with the sacrum, and the two pubes unite in front. In most mammals these three bones become ankylosed together to form the innominate bone. In the Cetacea (fig. 15) and Sirenia (fig. 8) the pelvis is in an extremely rudimentary condition, and hind limbs are altogether absent. The femur or thigh-bone corresponds to the humerus, and the bones of the shank—tibia and fibula—to the radius and ulna; in front of the articulation of the latter bones with the femur is found a large sesamoid bone, the patella or knee-pan. The foot consists of tarsus, metatarsus, and the phalanges of the digits or toes, closely resembling in structure the manus or hand. As a rule the number of digits in the foot is the same as in the hand, and the metatarsal bones undergo a degeneration similar to the metacarpals, but this is not always the case. Man is the only mammal that rests the whole foot, from the heel to the toes, on the ground, its main axis being at right angles with that of the leg. The higher apes rest obliquely on the foot, the sole being turned a little inwards, and in them the foot is more or less modified into a grasping organ, the great toe or hallux being strongly opposable; nevertheless the extremity of the hind limb remains essentially a foot, so that

the term *quadrumanous* (four-handed) applied to them is scarcely justified. Many animals, as the cat and horse, walk on the tips of their toes, while the bears and other plantigrade quadrupeds raise the tarsus more or less off the ground.

The bones of mammals do not contain air-cells, as in birds, but are either solid or filled with a fatty substance called marrow. Large air-cavities or sinuses are, however, greatly developed in the skull of the elephants and the ruminants.

True teeth [see TEETH] implanted in sockets in the jaws are present in all mammals, with few exceptions. The ant-eater (fig. 1) and the pangolin among the Edentata, and the cecidna among the Monotremata, have no teeth. The other monotreme, the duckbill or ornithorhynchus, has four horny plates which function as teeth. The whalebone whales (fig. 15) have no teeth, except in the foetal condition, when minute denticles are concealed beneath the gum; in the place of teeth they have plates of whalebone or BALEEN fringed by bristles, attached to the palate. The teeth of mammals are not ankylosed with the jaw, as in many reptiles, and they may have two or more roots. In the Edentata and Cetacea a single set of teeth persists throughout life, growing uninterruptedly; to such mammals the term *monophyodont* is given by Owen. In most mammals, however, the teeth are neither replaced from time to time nor grow persistently, but the first set of teeth is replaced in the course of growth by a second set of permanent teeth. The first teeth are called milk-teeth, since they are generally present during the period when the young animal is nourished by the milk of its mother. They are always shed and their roots absorbed before the animal reaches maturity; in some cases, indeed, as in the seals, they are quite transitory, being shed before or a few days after birth. To those mammals which possess these two sets of teeth the name *diphyodont* is applied. In many mammals the teeth can be divided, according to form, position, and function, into four kinds—incisors, canines, premolars, and molars. The incisors are placed in the front of the mouth, and are inserted in the premaxillary bone in the upper jaw, and in the corresponding position in the lower. The incisors are frequently conical cutting teeth, but they sometimes attain a great development, forming the tusks of the elephants, mastodons (fig. 11), and dugongs (fig. 8). The rodents (fig. 4) are distinguished by the presence of two large chisel-shaped, ever growing incisors in each jaw. The canine of the upper jaw is the first tooth in the maxillary bone placed at or near the suture with the premaxillary, and the same name is given to the tooth in the lower jaw, which, when the mouth is closed, shuts in front of it. These teeth are so named from their great development in the Carnivora (figs. 12–14), and especially in the dogs; like the incisors they often become formidable weapons of offence and defence. So far the milk teeth and the permanent differ only in size and form, but the molar or grinding teeth of the milk dentition are fewer in number than those of the permanent dentition. The hindmost teeth of the permanent series have no milk predecessors, and are called molars, the rest of the molar series being known as premolars; in addition, the first premolar, the tooth following the canine, has usually no milk predecessor. The molar teeth have usually flat crowns marked with tubercles or ridges, according to the nature of the food; those of the elephants (figs. 9, 10) are remarkable for their large size, complexity, and the mode of their succession. The typical number of teeth possessed by a diphyodont mammal is forty-four, arranged as in the following dental formula:—

$$I. \frac{3-3}{3-3}; \quad \frac{1-1}{1-1}; \quad pm. \frac{4-4}{4-4} \quad m. \frac{3-3}{3-3} = 44.$$

The figures above the line denote the number of teeth on each side of the upper jaw of the kind denoted by the preceding initial letter; those of the lower jaw being denoted in the same way by the figures beneath the line. This typical dentition is displayed by some of the Insectivora and the fossil tertiary ungulates. In some of the Cetacea, as the dolphins, the teeth are very numerous, all equal or nearly equal and alike in form. In the Edentata also the teeth generally present no difference but that of size.

The digestive system of mammals [see DIGESTION] does not call for any special remarks. The process of digestion, as in other vertebrates, goes on in a tube, the alimentary canal, running from one end of the body to the other, and presenting various modifications. The first portion of the digestive canal, the mouth, is provided with fleshy lips in all mammals except the Monotremata, but in some of the Cetacea, as the porpoise, they are rudimentary. A fleshy tongue is always present, but is immovable and fused with the floor of the mouth in the whales. The food brought into the mouth and acted upon by the secretions of salivary glands is carried into the stomach to be digested, passing thence into coils of intestine of varying length, till the undigested portions are expelled at the anus. In the ruminants the stomach has a complicated character, owing to the share taken in it by the œsophagus, the first portion of the alimentary canal. The cropped grass passes into two expanded divisions of the stomach, and is macerated by the action of the chemical fluids contained therein. The fodder can now be returned through the œsophagus to be masticated in the mouth. It is a second time returned to the stomach, but now passing along an œsophageal groove, enters the two pyloric divisions of the stomach and undergoes digestion. The great digestive glands of the Mammalia are the liver and pancreas.

The CIRCULATION of the blood in mammals is double and complete. Venous blood is brought back from all parts of the body to the right auricle usually by two large veins, the *venæ cavae*; but in the marsupials, monotremes, elephants, and some members of the Insectivora, Cheiroptera, and Rodentia, the descending *venæ cavae* enter the auricle without uniting, as in birds. From the right auricle the blood passes to the right ventricle, whence it is carried by the pulmonary artery to the lungs, purified, and brought back by the pulmonary veins to the left auricle; thence it proceeds to the left ventricle, which distributes it by the aorta, which lies on the left side, over every part of the body. The blood thus performs two complete circulations, the pulmonary and the systemic. From the aorta arise the vessels to the head (carotid) and to the fore limbs (subclavian). These may be arranged in various ways; but most commonly the aorta gives off a right innominate artery, from which arises the two carotids and the right subclavian, the left subclavian springing directly from the aorta. In man the right carotid and the right subclavian have a common origin, while in ruminants all four arteries spring from a common innominate. A renal portal system is never found in mammals, the kidney receiving only arterial blood from the renal artery. The HEART has two auricles and two ventricles. In Mammalia both auriculo-ventricular valves are membranous, consisting of flaps attached by tendinous cords (*chordæ tendineæ*) to muscular prolongations (*musculi papillares*) of the ventricular walls. The apertures of the aorta and pulmonary artery are guarded each by three semilunar valves. In most ruminants, especially the larger kinds, there is a bent bone developed at the base of the heart. The red blood-corpuscles of the Mammalia differ from those of the lower vertebrates in being destitute of a nucleus; they are always circular in outline, except in the camels and llamas, in which they are elliptical. Arterial networks, called *retia mirabilia*, are sometimes found in mammals. In the sloths and the loris, for instance, the vessels

supplying the limbs break up into an immense number of small parallel trunks. In many ruminants an arterial network is formed at the base of the skull. In the Cetacea the intercostal arteries are broken up to an extreme degree, securing a reservoir of arterial blood for use during prolonged immersion.

The lymph, which is contained in the lymphatic vessels, is a clear colourless fluid containing colourless corpuscles, similar to those of the blood, and chyle, a milky nutritive fluid taken up by the lacteals of the small intestine. The lymphatic vessels in their course pass through lymphatic glands. See LYMPHATIC GLANDS.

The respiration of mammals depends on the piston-like movement of the diaphragm, aided by the movement of the ribs. The nostrils open in the Cetacea on the top of the head, being called blow-holes; those of the elephant at the extremity of the long proboscis. The trachea or windpipe leads from the mouth into the lungs, which are suspended freely in the chest, one on each side of the heart, and inclosed by serous membrane, the pleura. At its entrance into the chest the trachea divides into two divisions, the two bronchi, one of which enters each lung, and continually dividing breaks up into numerous minute air-tubes. The cavity of the trachea is kept open by its wall being stiffened by a number of cartilaginous rings, which are usually incomplete behind. The upper end of the trachea is modified into a membranous and cartilaginous box-like structure, the LARYNX, which forms the organ of voice. Some marsupials and edentates are totally without voice.

The urinary system consists of secretory organs, the kidneys, which are usually compact bean-shaped organs, a reservoir for the secreted fluid, the bladder, the canals between the former and the latter, the ureters, and the median urethra, through which the bladder, when filled, discharges its contents. In the Monotremata the ureters do not enter the bladder, but discharge their contents lower down into the uro-genital canal common to them and the ducts of the generative organs. Several remarkable ductless glands occur in the Mammalia, such as the suprarenal capsules, situated each near the inner part of the anterior end of each kidney; the thyroid body, lying just below the larynx; the thymus, a gland occupying a considerable portion of the anterior part of the chest. The spleen is another ductless gland of large size, of a dark-bluish colour, lying close to the left side of the stomach. Odoriferous glands are general in the Mammalia, forming undoubtedly in some cases a sexual attraction. The special glands of the Mammalia are the mammary glands, which may be regarded as aggregations of modified sebaceous glands. They exist in both sexes, but in the males are quite rudimentary and functionless. In the female they secrete a special nutritive fluid, milk, by which the young are nourished for some time after birth. They vary in number and position, but are always placed on the ventral surface, and in number have a general relation to the number of young at a birth. In the Monotremata a number of separate tubes open on the skin, and the area on which they open is only distinguished by the absence of hairs in the Ornithorhynchus, and forms a shallow depression in the Echidna. In the marsupials a pouch is formed by a fold of the integument of the abdomen, inclosing the mammary glands and the adjacent parts.

The BRAIN of mammals shows a higher development than that of the lower vertebrates. The cerebral hemispheres become very large, and in the higher mammals more or less overlap the other divisions of the brain. The hemispheres are connected by a special fibrous commissure, the *corpus callosum*, which is very small in the marsupials and monotremes. In many mammals the surface of the hemispheres is smooth, but in the higher members of the group it is convoluted to a greater or less extent. The lateral lobes of the cerebellum become very large in the

higher Mammalia, but the median portion is still large in the marsupials, edentates, and bats, and in the monotremes exceeds the lateral portions. The mesencephalon, which in the lower vertebrates forms two lobes, is divided in the Mammalia into four lobes, and gets the name of *corpora quadrigemina*. The organs of sense attain a high development, commensurate with increase of intelligence. The sense of touch is extremely keen in the bats, residing in the delicate membranous skin forming the wings, ear-conchs, and nose-leaves. The organ of hearing is remarkable for the greater development of the cochlea, which, except in the monotremes, is spirally twisted. Except in some swimming and burrowing mammals, an external ear or auricle, provided with muscles, is developed. The organ of sight is very imperfect in a few mammals, as in some species of moles and mole-rats (*Talpa caeca* and *Spalax typhlus*), where the skin and hair cover the eye. The eyes are also imperfect and functionless in the fresh-water dolphin (Platanista). The eyes of nocturnal mammals are usually large and the pupil round and very dilatable.

In most mammals the male reproductive organs (the testes) descend from the primitive internal position through the wall of the abdomen into the scrotum, a pouch formed by the integument; but in most rodents, and in bats and insectivores, they are withdrawn again into the abdomen after the breeding season. With the exception of the monotremes, which have been recently found to be oviparous, all mammals bring forth their young alive, and the structure of the female generative organs is modified in consequence. The ovaries are small, and the ova which they produce are minute as compared with those of birds and reptiles, and contain but little food-material. The oviducts become more or less marked off into three parts—the Fallopian tube, which receives the ovum, the uterus in which the foetal life is passed, and the vagina, leading to the uro-genital canal. In most mammals the oviducts of the two sides more or less coalesce in the middle line; this is most marked in the Primates, in which a median single vagina and uterus are formed, into the latter of which the Fallopian tubes open. In other mammals, as the Carnivora, Ungulata, Insectivora, bats, and Cetacea, the two uteri are not united throughout their whole length, but their upper portions are separate, forming the cornua or horns of the uterus. In many rodents the uteri are quite distinct; in marsupials only the lower portion of the vaginae are united, while in monotremes no union occurs.

Secondary sexual characters, or characters peculiar to one sex, usually the male, not directly related to reproduction, are frequent among the Mammalia. Through the law of battle for the possession of the female the greater size, strength, courage, and pugnacity of the male, his special weapons of offence, as well as his special means of defence, have been acquired or modified through the working of sexual selection (Darwin's "Descent of Man"). Odoriferous glands in many cases serve as a sexual attraction. Crests and tufts of hair, spots and stripes on the body, as well as superiority in coloration of the male over the female, seem to fall under the same principle of sexual selection.

In most mammals an intimate vascular connection is formed between the allantois and chorion of the fetus on the one hand, and the walls of the maternal uterus on the other, so as to provide for the respiration and nutrition of the embryo within the body of the mother. Such a structure, in which both the ovum and uterus take part, is termed the *placenta*. It consists essentially of vascular processes (*villi*) of the outer surface of the ovum fitting into vascular crypts of the uterine wall. From the vessels of the placenta to the foetal vessels a nutritive fluid passes by a process of diffusion. The placenta may be *non-deciduate*,

as in the Ungulata, where the villi of the placenta are so loosely connected with the uterine walls that at birth they are simply withdrawn from them. In mammals which possess a *deciduate* placenta, on the other hand, as Primates, Carnivora, and other orders, the more superficial layer of the uterine walls become so intimately united with the chorion as to be cast off at birth as the *decidua* or after-birth. The form of the placenta is also various. The *diffuse* placenta, which is present in most ungulates, Cetacea, and Sirenia, has the villi scattered evenly over almost the entire surface of the chorion. In the ruminants, on the other hand, the villi are collected in little tufts on the chorion forming the *cotyledonary* placenta. The Carnivora, the elephant, and hyrax, have a *zonary* placenta, in which the villi are collected in a broad band or zone. The orders Primates, Rodentia, Insectivora, and Chiroptera have the placenta limited to a small area, and bell-shaped or *discoidal*. The discoidal placenta of Primates is, however, distinct from that of these orders, being derived in course of growth from a diffuse placenta by a process of concentration, and may therefore be distinguished as *metadiscal*, as opposed to *protodiscal*.

Most mammals make some sort of abode for their young brood, in some cases making nests of grasses and such like, or forming burrows under the earth. Some mammals, as the hedgehog and dormouse, inhabiting temperate climates, pass the cold season in a state of torpor. See HIBERNATION.

The geographical distribution of mammals, owing to their limited means of transport, is more definite than in some other classes of the animal kingdom. The great geographical regions of the world in which mammals are distributed are the same as those for birds and for animals generally. These are (1) *Palaearctic*, containing Europe, Asia north of the Himalayas, and Africa north of the Sahara; (2) *Ethiopian*, containing Africa south of the Sahara, and its islands, and the southern half of Arabia; (3) *Oriental*, including India and Southern China, Formosa, all the Malay peninsula and islands as far east as Java, Borneo, and the Philippines; (4) *Australium*, containing Australia, Tasmania, New Zealand, New Guinea, and the islands of the Malay Archipelago east of "Wallace's line," which runs between Borneo and Celebes, Bali and Lombok; (5) *Neotropical*, including South America, Central America, Southern Mexico, and the West Indies; (6) *Neartic*, including the rest of North America. With special reference to mammals the Palaearctic and Neartic provinces are by some united under the name *Arctogaea*, while New Zealand is constituted a distinct province. Most mammals are terrestrial. One group, the bats, are fitted for true flight, while a few other forms, such as the flying squirrel and the so-called flying lemur, can sustain themselves in the air for a short space of time. Aquatic mammals are more numerous than aerial. The whales and other cetaceans and the Sirenia find a permanent home in the water, and from the structure of their limbs are totally incapable of locomotion on land, while the seals are almost as truly aquatic. Other mammals, such as the common otter, pass most of their time in the fresh waters of rivers, lakes, and streams, but are fully capable of terrestrial locomotion. The terrestrial mammals are entirely absent from New Zealand and all oceanic islands. In the Australian region the terrestrial indigenous mammals are, with the exception of the Muridae (mice and rats), a family of rodents, entirely confined to the two lowest divisions of the class, the marsupials and the monotremes. The latter are confined to Australia and Tasmania, and the marsupials are only represented outside the limits of this region by the opossums (Didelphidae) of South America.

In the classification of mammals it is necessary to recognize three great divisions, to which Professor Huxley has given the names Prototheria, Metatheria, and Eutheria,

the first answering to the Monotremata, the second to the Marsupialia, and the last to the placental mammals forming the remainder of the class. The Prototheria or Ornithodelphia contain the single order MONOTREMATA, which itself contains only two genera, *Echidna* and *Ornithorhynchus*. In this division the genital and urinary ducts and the rectum open into a common cloaca, and these mammals, as was discovered in September, 1881, lay large eggs which, like those of birds, contain much food-material, and in consequence undergo an incomplete segmentation. The Metatheria or Didelphia contain also but one order, MARSUPIALIA, and occupy an intermediate position in many respects between the Eutheria and the extremely low forms which constitute the Prototheria. In the marsupials, as in the higher mammals, the aperture of the genito-urinary ducts is quite distinct from that of the rectum. On the other hand, no placenta is formed, the young are born in an extremely rudimentary condition, and placed on the nipples, which are concealed in a pouch of the integument of the abdomen. The Eutheria or Monodelphia contain the remaining members of the class, which are often called placental mammals, from the constant presence of the placenta. The subclass Eutheria may be divided into the following orders:—EDENTATA or BRUTA (Plate, figs. 1, 2), INSECTIVORA (fig. 3), RODENTIA (fig. 4), CHEIROPTERA (fig. 5), UNGULATA (figs. 6, 7), PROBOSCIDEA (figs. 9, 11), HYRACOIDEA, SIRENIA (fig. 8), CARNIVORA (figs. 12–14), CETACEA (fig. 15), PRIMATES (fig. 16). This classification of the placental mammals, which is that of Huxley, is the one in general use. Professor Flower enlarges the order Ungulata for the admission of a number of extinct forms recently discovered in North America, which, though neither typically perissodactyle (odd-toed), nor artiodactyle (even-toed), were closely allied to the ungulates. His order Ungulata is first divided into two groups, *Ungulata vera*, contemporaneous with the old order Ungulata, and *Subungulata*, containing three sub-orders, Proboscidea, Hyracoidea, and Amblypoda, the last of which contains a number of fossil forms, such as *Dinoceras*, *Uintatherium*, *Coryphodon*, and *Toxodon*. The seals and walruses, which in Professor Huxley's classification form a suborder, Pinnipedia, of the Carnivora, are by some authors separated from that order. The order Primates is sometimes split up into the orders Quadrumana and Bimana, the one containing all the monkeys and lemurs, and the other containing man alone. The lemurs again, with more reason, are by some separated from the Primates, and constituted a distinct order under the name Prosimiæ.

The Mammalia are known to have reached us far back as the Triassic epoch. All the remains, however, that have been found in beds of the Secondary age consist of portions of the lower jaw or of teeth, so that the determination of the systematic position of these fossil mammals is attended with considerable difficulty. The oldest known mammalian remains are some teeth found in the Rhætic beds of Germany and England, and described under the name of *Microlestes antiquus*. The animal to which they belonged is thought to have been a very small carnivorous mammal, but whether it was marsupial or placental is impossible to say. In North America, Triassic mammals are represented by portions of the lower jaw bearing teeth, described under the name *Dromatherium*. The next traces of mammals occur in the Stonesfield slates (Oxfordshire), which belong to the lower Oolites. Amphitherium is founded on several rami of the lower jaw bearing teeth, and is considered by Owen to be most nearly allied to the marsupial *Myrmecobius*. Other remains from the same strata constitute the genera *Amphilestes*, *Plascolotherium*, and *Stereognathus*, the first two of which were probably marsupial, while the affinity of the last cannot be determined with any certainty. Towards the close of the Oolitic period in the Middle Purbeck beds, a number of remains referable to small mammals

have been found, all of which are probably marsupial. Among these are *Plagiaulax*, *Spalacotherium*, *Triconodon*. Throughout the successive formations of the Tertiary period mammals are found, both marsupial and placental. The Eocene formations, especially in North America, have yielded a number of forms presenting the characters of ungulates of a somewhat generalized type, and sometimes seeming to connect several orders which at the present day are sharply defined. In the full typical dentition, in the character of the molar teeth, and in the five-toed feet these ungulates recall the forms from which the present perissodactyles and artiodactyles must have descended. In the case of the horse the ancestry can be clearly traced by successive steps back to the Lower Eocene *Eohippus*, a little animal with four toes and a rudimentary pollex on the fore feet and three toes on the hind feet. Another feature of interest in connection with these primitive ungulates is the extremely small development of the brain, as shown by the size of the brain-case. The brain of the *Dinoceras*, according to Professor Marsh, was proportionately smaller than in any other known mammal, recent or fossil, and even less than in some reptiles.

(Huxley, "Anatomy of Vertebrate Animals;" Owen, "Anatomy of Vertebrates—Mammals;" Gegenbaur, "Comparative Anatomy;" Flower, "Osteology of the Mammalia.")

**MAMMARY GLAND** is an organ of considerable interest, from its occurring only in that important class of animals to which it gives its name [MAMMALIA], and whose greatest peculiarity is that, while young, their food is the milk secreted by the mammary glands of their mother. The number of mammary glands varies in different animals, but their position is always upon the ventral surface. In whales they are placed upon the groin, and are two in number. All mammae are composed of ramified ducts which open on the surface of a nipple or teat by a very minute orifice. In some animals, as ruminants, there is but one orifice at the extremity of each nipple; in others, and in man, there are several. Each orifice leads into a fine canal, which, however, soon dilates and ramifies with irregular and tortuous branches in the substance of the breast or udder. Each branch has either a simple closed extremity or terminates in a minute cellule, and numerous capillary bloodvessels ramify on their walls and secrete the milk into them. When the mouth of the young animal, by the action of sucking, produces a partial vacuum over the nipple, the weight of the surrounding medium presses lightly and equally upon the surface of the breast or udder, and propels the milk from the ducts in minute and gentle streams.

At the commencement of pregnancy the mammary gland, which up to the period of puberty had been but little developed, enlarges; its increase of size keeps pace with the progress of gestation, and before its termination a thin serous milky fluid begins to be secreted. Directly after parturition the quantity of milk increases, and it becomes more thick and rich, combining in itself all the best principles for the nourishment of the young animal. It continues to flow for a length of time, proportioned to the age at which the young animal can seek its own food, and then, gradually subsiding, the gland decreases to the same size which it had before pregnancy. In males of all species only a rudiment of this organ is found; yet there are not wanting instances in which milk has been secreted from the breasts of men and other male animals.

**MAMMILLATED** is a term used in mineralogy to describe the rounded and spheroidal forms which minerals sometimes assume; they are usually formed of aggregations of small crystals, and often have an internal radiated fibrous structure, the external surface presenting segments of spheres which intersect one another, and thus produce this peculiar appearance.

**MAM'MON**, god of this world. It is a Syriac word for riches, occurring in the Syriac version of St. Matthew's Gospel.

**MAM'MOTH** (*Elephas primigenius*) is an extinct species of ELEPHANT closely related to the Asiatic living species, *Elephas indicus*. The mammoth ranged over nearly the whole of the northern hemisphere in Pleistocene times, being contemporaneous with man. The mammoth was a colossal unwieldy animal, the skeleton measuring over 16 feet long, exclusive of the tusks, and 9 feet in height. The tusks were probably present in both male and female, those of the former measuring on the average 9½ feet long, and those of the latter 5½. The tusks are boldly curved, sometimes even describing a circle. The body was covered with a dense shaggy coat of reddish-brown wool, some 9 or 10 inches long, very soft and thick; interspersed among and protecting this under woolly hair were long coarse hairs of a deep brown colour and more than a foot long. Along the neck and back ran a thick heavy mane. The whole body was cumbrous, and the legs were shorter and the mouth and trunk larger than in the

case of the Indian elephant. The molar teeth resemble most closely those of the Indian species; but they are broader, and have narrower and more numerous and closely set transverse plates and ridges, whose edges are not festooned.

The structure and appearance of no other extinct animal is known with such certainty as that of the mammoth. Bones are found in enormous numbers in the river deposits of Middle and Northern Europe, and of North America. In Britain it is abundant in river-deposits and caverns, and there is evidence to show that it existed in this country before, during, and after the Glacial Period. [See ICE AGE.] In Europe it extended as far south as Spain, and as far north as Northern Germany, and also occurs in the auriferous gravels of the Urals. In Siberia the mammoths must have existed in countless herds. Entire carcasses have been found buried in the frozen morasses. In 1799 a Tungusian fisherman discovered, near the mouth of the river Lena, a huge mammoth imbedded in clear ice. For several years his fear overcame his love of gain; but at length, when the ice had partially melted, he chopped off



Mammoth Restored.

the tusks. The body of the monster thus left exposed was quickly mangled by bears and wolves; but two years after, when a Russian naturalist visited it, he found the skeleton intact with the exception of the fore-foot, ligaments still holding parts of the skeleton together, portions of the skin of the head, and the brain uninjured within the skull. Since then the mammoth has been met with in this wonderful manner several times. In the exceptionally warm season of 1846, on the banks of the Indigirka, a young Russian engineer, Lieutenant Benkendorf, had the remarkably good fortune to see a huge mammoth, complete as on the day of its death thousands of years ago, which had burst the bonds of its burial-place owing to the thawing of the tundra to an unusual depth. The examination of the stomach revealed the fact that this animal had fed on the shoots of firs and pines. In Siberia the fossil tusks are found in so perfect a state that they are regularly exported as ivory both to Europe and China.

There can be no doubt that the mammoth was a con-

temporary of prehistoric man, by whom it was doubtless hunted. In the cave of La Madeleine, in Auvergne, was found a piece of ivory on which is a spirited engraving of the mammoth.

(W. Boyd Dawkins "On the Range of the Mammoth in Space and Time," *Quarterly Journal of Geological Society*, xxxv. p. 138; H. H. Howorth, *Geological Magazine* for 1880 and 1881:—"The Mammoth in Siberia," "The Mammoth in Europe," "Extinction of the Mammoth.")

**MAM'MOTH CAVE.** See KENTUCKY.

**MAN** constitutes the sole specific example of the only genus, *Homo*, contained in Cuvier's order Bimana. Zoologists in general have now returned to the views of Linnaeus, and class *Homo* in the order Primates (or Simia), of which he forms a family or suborder.

The anatomy and physiology of man are treated of under their appropriate heads in this work. The present article is limited to the consideration of man as a zoological species.



In man the attitude is erect. The skull is nearly balanced upon the vertebral column, which has a double curvature, the curves being so arranged that when the body is in the erect posture a vertical line drawn from its summit would fall exactly on the centre of its base. The naturally erect position of man requires an expansion of the os sacrum and haunch bones for the lodgment of powerful muscles; and the strength and size of the lower limbs are such as not only to support with ease the weight of the body, but also to insure firm, easy, and graceful progression. The foot is broad, and the whole sole is applied to the ground; the leg bears vertically upon it; the heel is tumid beneath; the toes are short, the first far exceeding the rest in size, placed on the same line as the others, and not opposable to them. Nevertheless the non-opposable character of the great toe (or *hallux*) is to some extent the result of civilization.

The lower limbs of man being the exclusive organs of locomotion, at least on the ground, his anterior extremities are free and shorter than the legs, the reverse being the case in the anthropoid apes; during growth the disproportion is increased. The arms are well developed and muscular; the humerus rotates freely in the shallow articulating cavity of the scapula; the shoulders are kept wide apart by means of well-developed clavicles; the forearm is capable of pronation and supination, and the hand is at once an organ of touch and prehension; the thumb is truly opposable to the fingers, which are of unequal length, for the sake of insuring easier manipulation and greater precision.

In man the chest is large and expanded; it is flattened in front, and has greater dimensions transversely than in depth; the sternum is short and broad; the ribs are, on each side, seven true and five false, total twelve. The teeth are of equal length and approximating together, without intervals:—

$$I. \quad c. \frac{1-1}{1-1}; \quad pm. \quad 2-2 \quad m. \frac{3-3}{3-3}:$$

The canines are short, so that there is no *diastema* or break in the teeth; in this unbroken series Anoplotherium, an extinct artiodactyle ungulate, alone of all existing or extinct mammals, agrees with man. The premolars have two cusps, the molars four blunt cusps. The maxillary arch in man is smaller than in apes, and tends to a semi-circular form. The skin is sparsely covered with hair, which is chiefly developed on the crown of the head and in particular regions. The only two muscles which are found in man, and have not been found in any ape, are connected with the peculiar development of hand and foot; they are the *extensor primi internodi pollicis* and the *peroneus tertius*.

Food—fruits, grain, roots, and animal flesh; as a general rule, the diet of man is prepared by cooking for the stomach. In the colder regions oleaginous animal food is preferred; rice and farinaceous food in the hotter climates; and various are the degrees between these two extremes, according to latitude and national predilections.

Growth, slow; infancy, long; maturity acquired at a comparatively late period.

The nervous system is highly developed; the brain is large, with the cerebral hemispheres greatly preponderating and much convoluted. The mass of the brain is voluminous in proportion to the size of the nerves communicating with it. In consequence of the volume of the brain, the amplitude of the cranial portion greatly preponderates over the facial. Man has no projecting snout; the face is nearly on a plane with the rising forehead, and therefore below and not anterior to the brain; this position is peculiarly characteristic of man, for the crania of the chimpanzee and orang, which approach nearest to that of man, are altogether posterior to and not above the face.

With regard to the *questio rezata* of the difference between man and the higher apes, with its bearing on "man's place in nature," the following quotation from a distinguished German zoologist, Professor Claus, may be added to what has already been said in the article ANTHROPOLOGY:—"The most important anatomical differences between man and the apes depend upon the configuration of the skull and the face, the structure of the brain, the dentition and the formation of the extremities, the arrangement of which, in connection with certain peculiarities of the vertebral column, permit of the upright posture of the body in walking. The rounded arched form of the spacious cranial capsule, the considerable preponderance of the skull over the face, which is not placed in front of the skull as in the anthropoid apes and in other animals, but almost at right angles beneath it, are essential human characters, as are the relatively large mass of the brain, the great size of the anterior and posterior lobes, and, finally, the great development of the cerebral convolutions, which, however, in the apes are arranged on the same type. All these peculiarities, which are of the greatest importance for the intellectual development of man, cannot be regarded as fundamental distinctions, but must rather be ascribed to gradual deviations, since there are still greater differences between the highest and lowest apes. Efforts have been vainly made to show that certain parts, which are always present in apes and other mammals, are absent in man (*præmaxilla*, Blumenbach, Goethe); and the attempts to prove the converse of this, viz. that there are parts of fundamental value in the human organism (*pes hippocampi minor*, Owen, Huxley) which are found in no other mammal, have as completely failed. Further, the completely continuous row of teeth, interrupted by no gap for the opposed canines, a character by which the human dentition is distinguished from that of the Catarrhina, is not an exclusive human character, but is known in a fossil ungulate (Anoplotherium); while on the other hand similar gaps have been observed, certainly only in exceptional cases (Kaffir skull in the Erlangen collection), in the human dentition. The prominent chin of man has indeed the value of a characteristic feature, although even this is less conspicuous in the negroes; nevertheless it is obvious that this feature cannot be regarded as a character of fundamental importance." (Claus' "Textbook of Zoology," translated and edited by A. Sedgwick, London, 1883.)

Man is the only animal endowed with the gift of language, as distinguished from mere sounds instinctively uttered, and expressive of feelings or desires. Man is a true cosmopolite; he inhabits the dreary regions of the polar circle, the temperate latitudes, and the glowing countries of the tropics. He subsists with equal facility under various degrees of atmospheric pressure: the valleys and also the elevated table-lands of South America, some of which are 10,000 feet high, are alike inhabited by man—the barometer standing in the one at 30, and in the other at only 20 inches. Condamine and Bouguer with their attendants lived for three weeks at a height of 14,600 French feet above the level of the sea, where the barometer stood at only 15½ inches, the atmospheric pressure being therefore only a little more than half of that to which they had been accustomed.

Considerable differences occur in the average stature of different races. The Bushmen, for example, of Southern Africa are mere pigmies, the Kaffirs of the same country are tall and athletic; the Esquimaux are stunted, the Patagonians are often 7 feet in height. In all countries individuals are to be found, some far below the average standard, some far exceeding it; but these are examples of accidental departure from it. In temperate climates the average stature of the male varies from 5 feet 6 inches to 6 feet.

The great race of man is divided into a vast number of

families or varieties, distinguished from each other by physiognomy and slight structural details, by colour, by the characters of the hair, by language, by habits, manners, and customs, and by degrees of civilization. Like other mammals, man is subject to albinism, an affection which attacks him perhaps most frequently in hot climates. *Albinos* are distinguished by the total absence of the colouring matter of the cuticle, hair, and eyes—hence their skin is of a milk-white or pinkish hue; the hair silky, white, or at most yellowish; the iris rosy, and the pupil red. See ANTHROPOLOGY.

**MAN, ISLE OF**, is an island belonging to the crown of England, situated between  $54^{\circ} 2'$  and  $54^{\circ} 25'$  N. lat., and  $4^{\circ} 17'$  and  $4^{\circ} 50'$  W. lon. Placed in the middle of the St. George's Channel, it is within easy reach of the various countries of the United Kingdom, the distance from the Point of Ayre to Burrow Head, N.N.E., being 16 miles; from Peel to Lough Strangford in Ireland, N.W. by W., 27 miles; from Maughold Head to Whitehaven, E.  $\frac{1}{4}$  N., 31 miles; from the Calf of Man to Ardglass, in Ireland, N. W.  $\frac{1}{4}$  N., 31 miles; and from the Calf of Man to Holyhead, S.S.W., 45 miles. The length of the island in the direction N.E. by N. and S.W. by S., from the Point of Ayre to the Sound of the Calf, is  $33\frac{1}{2}$  miles. The greatest breadth is from Bank's Howe, near Douglas, to Ballanayre, to the north of Peel,  $12\frac{1}{2}$  miles. Its circumference is about 75 miles. The area is estimated to be about 145,000 acres. The population of the island at the census of 1881 was 53,492.

Approaching the island from the west by Douglas Bay the whole outline of the coast, with its variations of light and shade, its green hills, its dark cliffs, and its rocky headlands, presents a scene of surpassing grandeur. The first object that strikes the eye is Maughold Head, a bold promontory, forming the north-eastern point of the island, and which seems to start up suddenly from the water's edge; while behind it, the summits of Snaefell, 2021 feet in height, and North Barule, 1842 feet, the two highest mountains on the island, rise gradually into view. Towards the north the coast is bold and precipitous, with lofty cliffs that dip sheer down into the water, divided here and there by deep gullies, through which the mountain streams, often rich in trout, find their way to the sea. Southwards the highlands shelve gradually down, till at Castletown, the ancient capital of the island, and still retaining the nominal distinction of being the metropolis, though the seat of government has been virtually transferred to Douglas, the land is quite flat. From this point the land rises again, till its rugged coast-line terminates in the Calf, a rocky island some 5 miles in circumference, but containing very little cultivated ground. It is, in fact, a mere pile of lofty crags, some 500 feet high, inhabited by rabbits and sea-fowl. The Sound which separates the Calf from Spanish Head on the mainland is full of dangerous currents; and the iron-bound coast in this neighbourhood has been the scene of many a terrible wreck.

Spanish Head is the grandest of all the majestic and precipitous headlands of the island. It rises straight out of the sea to a height of more than 300 feet, pierced by numerous chasms, which bear evident traces of a volcanic origin. It derives its name from the fact that several of the ships of the Spanish Armada were dashed to pieces there in the awful storm which proved England's best ally. At the southern extremity of the Calf are two remarkable rocks, called the Burrow and the Eye. They rise to a height of 100 feet above the sea; both are pierced with natural archways, and one of them, the Eye, is perfectly insulated.

Inland a range of mountains extends from north-east to south-west, affording extensive views of the beautiful and varied scenery of the island, and which have been rendered more accessible by the construction of several

good roads. Trees are not plentiful; but the green hills which bound the valleys on either side attract the eye of the pedestrian by their variations of shade and colour, and the picturesque form of their outlines. On a clear day the view from Snaefell is grand in the extreme, and England, Ireland, Scotland, and Wales are distinctly visible. Of the ten principal rivers in the island, the largest is the Sulby; there are also numberless brooks and rivulets. It is this plenitude of water which gives such refreshing variety to the scenery of the Isle of Man.

Lead, zinc, iron, and copper are found in various parts, and there is no question but that its mineral wealth is very great. The oldest mines in the island are those at Laxey, Foxdale, and Bradda. In modern times a great improvement has taken place in agriculture; the productive character of the soil has been developed; and the exports of grain, green crops, and cattle (more particularly the latter) have increased enormously. Lime is readily obtained from the beds of carboniferous limestone in the neighbourhood of Castletown and Port St. Mary, and after almost every storm thousands of tons of seaweed are carted off the coasts and used as manure. The fisheries, though no longer the sole industry of the island, as in former times, if piracy and smuggling be excluded, still afford employment to a large proportion of the inhabitants. The number of Manx fishing boats, decked and undecked, is upwards of 600, employing about 3800 men and boys, and 3,600,000 square yards of netting. The herring is the chief source of revenue, and Port St. Mary, as well as Peel, on the western shore of the island, has a large share of the fishery; its inhabitants own about eighty fishing smacks, manned by 600 men and boys. The number belonging to Peel is more than twice as great; but the Cornish and Irish fishing boats, which are, together, far more numerous than all those of the Manxmen, are wont to assemble at Port St. Mary. The Manx fishermen and peasants are good, honest, sober, and quiet folk, much like those of the Hebrides and the western and northern coasts of Scotland.

The island has many antiquities, old customs, and places of historical interest. At St. John's, about 3 miles on the Douglas side of Peel, is Tynwald Hill, an artificial mound some 80 feet in diameter, and about 12 feet in height. Here, on the 5th of July each year, are promulgated all the laws that have been passed by the Manx Parliament during the preceding year. The ceremony is made the occasion of a great meeting of the people, and the chief authorities attend divine service in the chapel of St. John. This custom is said to date back more than 1000 years. Peel Castle, so familiar to the readers of Sir Walter Scott's "Peveril of the Peak," for the last 100 years has been nothing more than a beautiful ruin. Two of the chapels mentioned by Waldron still remain, dedicated respectively to St. German and St. Patrick. The former, indeed, is still the cathedral of the diocese of Sodor and Man; for although it has long been in a dilapidated condition, it has never yet been repaired by another, and open-air services are held among the ruins during the summer months. The ruins stand some 50 yards from the land, on a rugged island, which is in reality the spur of a ridge of rocky hills gradually shelving down to the shore.

The early history of the Isle of Man is rather obscure, but there is not much doubt that the people are of Celtic origin, the Manx language having strong affinities with the Irish and the Gaelic of the Highlands. A Manx tradition states that in the beginning of the tenth century Orry the Dane arrived with a strong fleet, and landed in the north of the island. The people, maddened by the tyrannical acts of their king (Thorstein), were glad to receive such a powerful leader as Orry, and they at once placed themselves under him. It is stated that when Orry landed he was asked whence he came. Upon this he pointed to the Milky Way in the heavens, and said,

"That is the road to my country." Hence to this day the Manx name for the Milky Way is, *Road mooar Ree Gorrée*, i.e. "the great road of King Orry." Orry and his followers were heathen worshippers of Odin. During the eleventh century the Danes in the Isle of Man and those in Dublin maintained a very close connection, but subsequently we find the Scandinavians in power. In 1246, however, Alexander, king of Scotland, purchased the right and title to the Isle of Man and the Hebrides for 4000 marks sterling, but on the king's death the Manx placed themselves under the protection of Edward I. of England. In 1397 Sir William Seroop, afterwards earl of Wiltshire, purchased the island, but it subsequently came into possession of the Earl of Northumberland. He was deprived of it in 1406 by Act of Parliament, when it was granted to Sir John Stanley, his heirs and successors, on his paying to the kings of England a cast of falcons at their coronations. It continued in the Derby family, with some interregnums, until 1735. In 1753 James, second duke of Athole, became Lord of Man in his wife's right; but the British crown finally purchased the island from the Athole family. Since 1805 the island has been under lieutenant-governors appointed by the crown and responsible to them. The lieutenant-governor, the Governor's Council, and the House of Keys constitute the three political estates of the island. The last is now elected by the people, and the qualification of a voter is fixed at "£1 annual value, owners and tenants all round." A still more liberal measure of reform also was adopted—the granting of the franchise to female property-owners. By this last Reform Act the number of voters has been largely increased. The working of popular representation in the government of the island has infused new life and energy into the conduct of affairs. The erection of harbour works at the various ports, the construction of railways, the extension of local government in the towns, reforms in the system of jurisprudence, the introduction of compulsory elementary education, and the establishment of a daily mail between Liverpool and Douglas may be enumerated among the improvements which have been effected. A sum of £10,000 a year is paid to the imperial exchequer as the island's share of the cost of the maintenance of the army and navy.

The natives speak a dialect of Erse known as Manx, which is rapidly becoming obsolete. It has, however, been preserved from being totally lost by the Manx Society, which has published a complete dictionary and grammar of it. The country people still retain a plentiful store of those fantastic legends which overawed the reason of a credulous age and excite the curiosity of our own. During the last twenty or thirty years, since the establishment of steam communication with other parts of the kingdom, the island has risen into great favour as a watering-place. The number of visitors now averages nearly 150,000 every summer, and is increasing every year as the island gets better known. Its genial climate, beautifully clear seawater, and picturesque scenery, are most powerful attractions as a health and rest resort. The principal towns in the island are Castletown, Douglas, Peel, and Ramsey.

**MAN WITH THE IRON MASK.** See IRON MASK.

**MAN'AKIN** (Pipridæ) is a family of Passerine birds closely allied to the American Chatterers (Cotingidæ or Ampelidæ). The manakins are beautiful little birds inhabiting the forests of tropical South America, associating in small bands and feeding on berries, &c. They are so remarkable for liveliness and activity that they have been called personifications of perpetual motion. The bill is short, the feet feeble, and the outer toe is united to the middle toe for a good part of its length. The colour of the plumage is usually brilliant and varied. Some sixty species of this family are known, which have been placed in fifteen genera. All the birds are of small size. The

Capped Manakin (*Pipra pileata*) belongs to the typical genus *Pipra*. This bird is of a fine cinnamon-brown colour above, yellow beneath; the crown of the head is covered with black feathers, which are capable of being raised so as to form a sort of crest, and over each eye is a yellow streak. The quill feathers of the wings are black. The Red-headed Manakin (*Pipra rubra-capillata*) is of a deep lustrous black colour, with the head orange red; and the White-headed Manakin is also black, with the head pure white. The Blue-headed Manakin is olive-green above with the head blue and the rump yellow; the lower surface is yellow, and the quill feathers are black. All these species are little more than 3 inches in length.

**MANATEE** (*Manatus*) is a genus of aquatic mammals belonging to the order SIRENIA. The manatee, the origin of the mermaid myth, has a somewhat fish-like body, terminated by a flattened, shovel-like horizontal tail. The body, the usual length of which is not more than 8 or 9 feet, is covered with a dark coarse wrinkled skin, which resembles considerably that of an elephant, and is scantily provided with hairs. The fore limbs are flattened into paddles, and show externally no trace of division into digits, except for the presence of three small flat nails. Hind limbs are entirely wanting, though rudimentary pelvic bones are present, which do not, however, form any connection with the vertebral column. The head is conical, and scarcely separated from the trunk. The muzzle is blunt and peculiar in shape; at its apex are the nostrils, two minute slits shaped like a half moon. The upper lip is cleft in the middle into two lobes, which by their separate movement enable food to be taken into the mouth without the assistance of the lower lip; each lobe of the upper lip is provided with short stiff bristles. The minute eyes are situated at the sides of the head. In the front of the mouth the place of incisor teeth is usurped by a roughened horny plate in each jaw. Beneath these plates are, in the young animal, four minute incisor teeth, which never reach the surface, and disappear before maturity. Canines are always absent. The molar teeth succeed one another from before backwards, as in the elephant, the more anterior ones being shed before the hinder ones make their appearance; in consequence, although eleven are developed in all on each side in each jaw, there are seldom more than six present at the same time. These molar teeth have square crowns raised into transverse ridges. The manatee has only six cervical vertebrae, and is thus one of the three exceptions to the rule that all mammals have seven vertebrae belonging to the region of the neck, the other exceptions being two species of sloth. The mammae are two in number, placed close to the arm-pits.

The manatee inhabits the African and American continents. The African Manatee (*Manatus senegalensis*) is usually considered a distinct species; it is found along the west coast, and ascends the Senegal, Niger, Congo, and other rivers. The American Manatee (*Manatus australis*) inhabits the Gulf of Mexico and West Indies, Brazil and Guiana, the South American form being sometimes distinguished as *Manatus litorestris*.

Manatees inhabit the sea shore, especially near the mouths of rivers, and even ascend the rivers themselves. They spend all their life in the water, browsing on the aquatic vegetation, and only raising the head out of the water at regular intervals for the purpose of breathing. They are usually found associated in small troops. They are very harmless and gentle, and display great attachment to their young. Their numbers are on the decrease in consequence of the persecution to which they are subjected by man. The oil obtained from the blubber is of fine quality, the flesh is very wholesome, and being considered fish may be eaten by Roman Catholics on fast days, while the hide is made into harnesses and whips. The Northern Manatee or Sea-cow (*Rhytina stelleri*) belongs to a closely allied

genus, and has only become extinct within a comparatively recent period; it is noticed under the head *RHYTHIA*.

**MANCHE, LA.**, a department in France, consisting of the peninsula of Cotentin and the district of Avranchin, parts of the former province of Normandy, bounded S. by the departments of Ille-et-Vilaine and Mayenne, E. by those of Orne and Calvados, N.E. N. and W. by the English Channel, which is called in French *La Manche*, whence the department takes its name. Its greatest length from north to south is about 90 miles; its average width is about 27 miles. The area is 2292 square miles, and the population in 1886 was 520,865.

*Rivers, &c.*—The department is traversed from south to north by hills of no great elevation, which branch off from the Armoric chain, and terminate northwards in Cape La Hague. These hills slope down gradually towards the coast on the eastern and western sides of Cotentin, in some places presenting bold cliffs against the sea, in others subsiding into sands and benches of vast extent, which are always covered at full tide. Along the coast there are several harbours and roadsteads, the most important of which are—Cherbourg, La Hague, Granville, Regueville, Carteret, &c. Among the numerous islands that stand in near the coast, besides the Channel Islands, are—Mont St. Michel, the Chaussey group, Pelée, north-east of Cherbourg; and Tatihou and St. Marcout, on the east coast of Cotentin. Most of these islands are fortified and garrisoned; many of them, traditions say, were once joined to the mainland. From the nature of the surface the rivers must be all of short course: the principal are the Vire [see CALVADOS], the Taute, Merderet, Douve, and Selune, all navigable. Capes La Hague and La Hague, and Point Barfleur, are on the coast. The climate is mild but moist, and too cold for the cultivation of the vine.

*Products, &c.*—The department yields more of bread-stuffs than suffices for the consumption. Wheat, barley, rye, buckwheat, black oats (cakes made of which form the chief food of the labouring class), and potatoes are the chief crops. Apple and pear trees are extensively cultivated for making cider and perry, the favourite beverages of the country. Of cider, 30,000,000 gallons are made annually; some of it, especially that made near Avranches, is of excellent quality. Hemp and flax are grown in considerable quantity on the eastern slopes of Cotentin. Fruits of various kinds are sedulously cultivated in the arrondissement of Avranches. Horses of the true Norman breed are numerous, and yield the breeder good prices; they are much sought after as cavalry horses, and are said to be the best in France. The pastures are good and extensive, affording food for a great number of horned cattle of large size and excellent fattening qualities. A considerable number of sheep are fed on the sandy plains which extend between the sea and the cultivated land; they are small, yield inferior wool, and have sweet flesh. Game, water-fowl, and fish of all kinds are abundant. The department is rich in minerals. Iron, lead, and coal mines are worked; granite and building stone are quarried; marble, slate, potter's clay, and limestone are found. Mineral springs are numerous; there are a few salt marshes along the coast.

*Manufactures, &c.*—Manufacturing industry is actively exerted in the making of iron, the working of zinc and copper, the fabrication of plate glass, serge, calico, drugget, cutlery, woollen stuffs, lace, tape, haircloth, linens, porcelain, oil, hardware, cotton yarn, paper, leather, soda made from kelp, basket-work, &c. Shipbuilding is actively carried on at Cherbourg and other towns on the coast. The articles enumerated and the products of the soil support an active commerce and coasting trade.

The department is divided into the six arrondissements of St. Lô, Coutances, Valognes, Cherbourg, Avranches, and Mortain. The capital is St. Lô.

**MANCHESTER** is situated in the south-east of Lancashire, on the river Irwell, which separates it from the borough of Salford. It is 186 miles north-west by north from London by the old coach roads, but 188 miles by the London and North-western Railway, 31 miles from Liverpool, 41 from Sheffield, and 85 from Birmingham. One of the greatest railway and canal centres in the kingdom, it is unrivalled by any city in the world for the extent of its manufactures and the perfection of its industrial machinery. The borough of Salford is virtually a part of the city, communicating with it by ten bridges, and a suspension bridge between Lower Broughton and Poddleton. The parish of Manchester is of great extent, and includes numerous townships. Both the city and the townships have increased with great rapidity during the present century, and together now form the wealthiest and most populous community in the British dominions. In 1801 the parish of Manchester contained 112,300 inhabitants; in 1851, 451,754. It is now considerably over 600,000.

Manchester was made a parliamentary borough by the Reform Act of 1832; in 1838 a charter of incorporation was granted, and it was raised to the dignity of a city in 1853. From 1868 it returned three members to the House of Commons, and under the provisions of the Redistribution Act of 1885 it has six representatives. For municipal purposes it is divided into fifteen wards, and is governed by a mayor, sixteen aldermen, and forty-eight councillors. The population of the municipal borough in 1881 was 393,584, as against 316,213 in 1851; and of the city proper in 1881, 341,414, as against 303,382 in 1851.

The city of Manchester is a place of great antiquity, having existed from the time of the Roman occupation of Britain, when it was called *Mancunium*, evidently from the name which it bore as a settlement of the Brigantes, *Mancunio*. It was a borough in the time of the Anglo-Saxon kings. The conversion of its inhabitants is said to have been accomplished by Paulinus about 627. It was occupied by the Danes in the ninth century, but they were expelled in 923 by Edward, king of Mercia.

The De Gresleys were Barons of Manchester for several generations after the Conquest; and it was from Thomas de Gresley or de Grelle, one of the barons, that Manchester obtained its governing charter in the year 1301. Many years previously King Henry II. had granted to the De Gresleys the right of holding markets and fairs at Manchester. To the Gresleys succeeded the La Warres, and in 1422 Thomas la Warre, rector of Manchester, and the last of his name, having succeeded to the barony, determined upon collegiate the then existing rectorial church, and at his own cost founded a college as a residence for the warden and the staff of subordinate ecclesiastics who were to minister in it. The foundation of the college was followed by the enlargement of the church, which, with its successive additions, eventually became the cathedral.

Manchester began to be a manufacturing town in the reign of Edward I., and was the most active inland trading place in the north of England in the reign of Henry VIII. Manchester cotton is spoken of as early as 1352, but the fabric so designated was really a coarse woollen cloth. At that time, and considerably later, the woollen manufacture was the principal branch of industry carried on. For this it was admirably suited, owing to the abundant supplies of water and of water-power furnished by the three rivers, the Irwell, the Irk, and the Medlock, which unite at or flow through the city, and which bring together at that point a greater amount of water-power than is to be found at any other place in Lancashire. Soon after the woollen manufacture had been established, that of linen was introduced, the chief supplies of yarn being obtained from Ireland, by way of Liverpool. Somewhat later the cotton manufacture was commenced, which gradually took the lead of all the rest.

The questionable honour of a right of sanctuary was conferred on Manchester in 1540; but this was soon found to be an intolerable nuisance, and was abolished at the petition of the inhabitants in the succeeding year by a special Act of Parliament. The preamble of the Act abolishing the right of sanctuary at Manchester shows how much progress the place had made even in the reign of Henry VIII. It states that the town of Manchester is well inhabited, and distinguished for its trade both in linens and in woollens; that the inhabitants have obtained rich and wealthy livings, and employ many artificers and poor people; and that by "their strict and true dealings" they have given rise to the resort of many strangers from Ireland and elsewhere with linen yarns, wool, and other necessary wares for making of cloth to be sold there. The preamble then proceeds to state that in the course of the manufacture of linen the flax and yarn have to lie out in the fields night and day for half a year, to be whitened or bleached, before they can be made into cloth; and that the woollen cloth made in the town and neighbourhood must also hang on the tenters to be dried before it can be dressed. It further states that Manchester, besides being the principal place for manufacturing linens and woollens, is also frequented by the manufacturers of the neighbouring towns and villages to bring goods to be finished and sold. "Many strangers," says the same preamble, "inhabiting other townships and places have used customarily to resort to the said town with a great number of cottons to be altered and sold by the inhabitants, whereby many poor people have been well set to work, as well with dressing and frizzing of the said cottons, as with putting to sale the same." "All these persons," says the preamble of the Act, "are endangered by the resort of light and evil-disposed persons to the town." For these and other reasons, it was proposed and enacted that the right of sanctuary should be taken away from Manchester and be transferred to Chester, where there was no such occupying of merchandise. Such was Manchester in the reign of Henry VIII. and of Elizabeth. It was already an industrious and flourishing manufacturing town, where the woollen and linen trades were carried on with spirit and success; a place much frequented by strangers for the purposes of trade, and the trading capital of all the adjoining districts, as it is to this day. The first Manchester manufacturer of great note was Byrom, one of the three famous clothiers of England. About eighty years after his time arose Humphrey Chetham, a most successful manufacturer, who nobly employed his great wealth in founding an hospital and library at Manchester. In the year 1638 Manchester contended with York for the honour of becoming the seat of a university, which it was then proposed to found in the north of England. In a memorial numerously signed by the nobility, gentry, clergy, and freeholders, and other inhabitants of the northern parts of England, it is stated that Manchester "is about the centre of the northern parts; a town of great antiquity; formerly both a city and a sanctuary, and now of great fame and ability by the happy traffic of its inhabitants; for its situation, provision of food, fuel, and buildings, as happy as any town in the northern parts of the kingdom." About the same time Lewis Roberts, in his "Tressory of Traffic," says:—"The town of Manchester, in Lancashire, must be herein remembered, and worthily, for their encouragement, commended; who buy the yarn of the Irish in great quantity, and weaving it, return it again into Ireland to sell. Neither doth their industry rest there, for they buy cotton wool in London that comes first from Cyprus and Smyrna; and at home work the same, and perfect it into fustians, vermilions, dimities, and other such stuffs, and then return to London, where the same is vended and sold, and not seldom sent into foreign parts, who have means at far easier terms to provide themselves of the same materials." Forty years later Andrew Yarranton, an able writer on trade, in urging the establishment of the tape and

thread manufacture in Warwickshire, says "that if they once fix well in that manufacture there, they will become the great masters of it, as Manchester is of all things it trades in."

In the great Civil War Manchester adopted the side of the Parliament very early, and with great determination repulsed the royalist forces under James, earl of Derby, the lord-lieutenant of the county of Lancaster, who had laid siege to the place. It afterwards, however, became dissatisfied with the rule of Cromwell and the army, and welcomed with enthusiasm the restoration of monarchy.

The agitation for the repeal of the Corn Laws, which finally resulted in the abolition of all import duties on corn, had its origin in Manchester; and its success was due to the league formed there in 1839, of which Cobden, Bright, and Villiers were such energetic and brilliant members.

In 1862 the stoppage of the American cotton supply through the Civil War gave rise to great distress in Manchester and the surrounding districts—nearly half a million persons having received relief from the funds liberally subscribed throughout England.

Until about the year 1720 Manchester did not possess the advantage of water carriage with any other part of the county of Lancaster. The river Irwell is not naturally navigable either to the sea or above the city, but in the year 1720 an Act was obtained for the purpose of rendering it so, from Manchester to the point where it joins the Mersey, and of rendering the Mersey also navigable to the tide-water of the estuary at Warrington, and thus to the port of Liverpool and the sea. This was the first great improvement in the means of communication between Manchester and distant parts. A much greater one was effected between the years 1758 and 1777, when Francis, duke of Bridgewater, constructed his celebrated canals. The first of these extended from the duke's coal mines at Worsley, about 7 miles distant, to Manchester, crossing the Irwell at Barton by an aqueduct which was then considered the greatest work of the kind that existed in England. The second and much more important canal, constructed by the genius of Brindley supported by the wealth of the Duke of Bridgewater, was one joining that from Worsley, at a short distance from Altrincham, and extending to the estuary of the Mersey at Runcorn, a distance of about 25 miles. By means of this canal the merchants and traders of Manchester obtained a cheap and easy communication with the port of Liverpool and the sea, available at all tides. Subsequently the Manchester and Warrington Canal was greatly improved, extended to Runcorn, and, as the Mersey and Irwell Navigation, became one of the most useful lines of internal communication in the kingdom. A waterway of greater magnitude and of more importance to the trading and manufacturing district of which Manchester is the centre was commenced in 1887—a ship canal for the conveyance of ocean-going vessels from the sea direct into the heart of the town. The canal will be 3½ miles long, and will impound the water by a series of locks; after leaving Manchester it will pass through the outer basins of the Mersey and Irwell Navigation Company above Runcorn, whence it will be continued along the Runcorn shore and past the mouth of the river Weaver into the Fordham marshes, whence it will pass inland and continue to a point near Eastham Ferry, where it will re-enter the Mersey in deep water. A depth of 26 feet of water will be maintained throughout the entire length, and the docks, which will be situated on the western side of Manchester, will allow steamers of the largest size to load and unload at the quays. The estimated cost of the undertaking is £6,875,000. See CANAL.

In the year 1830 Manchester took the lead of all the manufacturing towns in the kingdom in obtaining the advantage of the railway system, and is now the central point of a perfect network of lines.

In addition to the great facilities for trade just described, the modern progress of the manufactures of Manchester owes much of its rapidity to the invention of the steam engine, and the introduction of steam power into the cotton and other trades. Two great beds of coal of extraordinary richness almost encircle the city, and no doubt extend under it, though at a considerable depth. These have been worked with great energy and success, especially on the Pendleton side, where mines have been sunk to the depth of from 1500 to 1800 feet, which yield large supplies of coal suited for manufacturing purposes. Manchester is therefore as well suited for carrying on manufactures that depend on steam as it formerly was for those then depending on water power. Hence the progress of modern invention, instead of arresting its prosperity, has given it a wonderful impulse, the limits of which it is impossible to anticipate. The principal manufacture of Manchester is that of cotton, which has now existed there for nearly 250 years—the Levant cotton having been worked into fustians and velvets as early as the commencement of the seventeenth century. Calicoes were first made in 1772, and muslins in 1781. At present every description of cotton goods is manufactured; and nine-tenths of the raw material, of which more than 1,700,000,000 lbs. were imported into this country in 1886, chiefly through Liverpool, are consumed in Manchester, or within 20 miles of it. In addition to the cotton manufacture that of silk is also very extensively carried on at Manchester. This trade was introduced in 1819-20. The manufacture of machinery of all kinds has also become a great source of employment in the town and neighbourhood. The factories of Manchester are remarkable, generally, for cleanliness, ventilation, regulated temperature, and orderly economy.

The city of Manchester, originally built, like nearly all the cities and towns of England, with narrow crooked streets, has been almost entirely rebuilt and reconstructed during the last fifty years, and now possesses many of the widest and best streets in the kingdom. Numerous warehouses, many of them of extraordinary size, have been constructed in the best business streets. During the same period the introduction of railways and omnibuses has in a great measure changed the habits of the more prosperous part of the inhabitants, and instead of residing in squares and streets within the city as in former times, they now live in elegant villas in the neighbouring country.

The most celebrated building in Manchester is the Town Hall, which was opened in 1877, after having been over ten years in course of erection. It cost about a million sterling, and stands on a triangular site to the south west of Albert Square. The design is Gothic. The principal front is in Albert Square, and its most striking feature is the central tower, which is 280 feet high, 36 feet square, and is divided into six storeys, independent of the belfry. In the tower is placed a fine peal of twenty-one bells. The building comprises a council chamber, with a number of committee, banqueting, reception and ante-rooms, besides offices for the various departments of municipal business, and in the centre is a great public hall, which contains a fine organ and some admirable marble busts of her Majesty, the late Prince Consort, and the Prince and Princess of Wales. The walls are covered with fresco paintings, and the ceiling is panelled, the divisions being filled with the arms of all nations. At each corner of the triangular plan is a circular staircase, giving access to the corridors which communicate with the numerous rooms and offices. These staircases are built respectively of English, Irish, and Scotch granite, and are named accordingly. The exterior of the building is ornamented with sculpture illustrative of the history of Manchester.

A spacious Royal Exchange has been recently erected, the former building having become quite unequal to the vastly increased trade of the city. Other public edifices

worthy of notice are the Stock Exchange, opened in 1868; the Royal Institution, an edifice of the Ionic order; the Free Trade Hall, built in the Lombardo-Venetian style, to commemorate the success of the free-trade movement, large enough to hold 7000 persons; the Theatre Royal; the Queen's Theatre, opened in 1871; the splendid Assize Courts, in decorated Gothic, the best building of the kind in the kingdom; the Chetham College Bluecoat School, founded 1653; Bishop Oldham's Grammar-school, founded 1515, endowed with a large number of scholarships; Lancashire Independent College, at Withington; Wesleyan Theological Institution, at Didsbury; Royal Infirmary and Dispensary, founded 1752, with statues of Wellington, Sir R. Peel, Watt the engineer, and Dr. Dalton; School for Deaf and Dumb, Henshaw's Blind Asylum, and School for Adult Deaf and Dumb, at Old Trafford; Industrial School, at Swinton, in the Tudor style; and the new County and City Gaols. There are in the boroughs of Salford and Manchester altogether about seventy churches belonging to the Establishment; ten Roman Catholic, and upwards of one hundred dissenting chapels, some of which, such as the Catholic Cathedral and the Cavendish Independent Chapel, are very beautiful specimens of architecture. There are also three Jewish synagogues, two German and a Greek church.

A permanent art collection was established by the Manchester Corporation in 1862. It is situated in the Royal Institution, and among the many fine pictures it contains is Holman Hunt's "Shadow of the Cross." The Art Treasures Exhibition of 1857 and the Fine Art section of the Royal Jubilee Exhibition of 1887 were both very successful attempts to exhibit the artistic wealth of the British possessions. The former exhibition had the distinction of being the first attempt to bring together the art treasures hidden in private collections, while in 1887 the exhibition contained characteristic examples of the work of every British artist of note during the reign of Queen Victoria. The industrial section of the exhibition was equally successful, displaying in a manner never before attempted the machinery and textile manufactures for which the district is famous.

The Manchester School of Art occupies handsome buildings near All Saints' Church. Manchester is the seat of the VICTORIA UNIVERSITY, Owens College being the first and most important college of the university. Other educational institutions are the Manchester Grammar School, mentioned above, the Technical School, and the Athenaeum. Manchester was among the first to adopt the Free Libraries Act, and, in addition to the Central Reference Library, now housed in the old Town Hall, has branch libraries in all parts of the town.

The city is amply supplied with water from extensive reservoirs constructed in the valley of the river Etherow, and along its course for about 5 miles, and conveyed thence in large pipes a distance of about 17 miles. These works are perhaps the most extensive of the kind in Europe. Altogether about £2,500,000 have been invested in them; and as a further means of supply the corporation has become the possessor of Lake Thirlmere in Cumberland, as well as the gas-works and the market and manorial rights, which latter cost £200,000. The corporation devote the profits accruing from these works to city improvements.

In the year 1844 some spirited inhabitants determined to provide several public parks for the accommodation of the people. A very large subscription was entered into for this purpose, and three parks, named respectively the Queen's, the Peel, from the late Sir Robert Peel, who was one of the warmest and most liberal supporters of the plan, and the Phillips' Park, were constructed in the townships of Salford, Bradford, and Harpurley, and opened in 1846. Victoria Park, to the south of Manchester, has handsome villas around it. The Alexandra Park, for the suburbs of Chorlton-on-Medlock and Hulme, 60 acres in

extent, was constructed at the cost of the corporation and opened in 1870. An excellent statue of Oliver Cromwell was presented to the city in 1876 by Mrs. Heywood, and was erected on the spot where the first man killed in the Parliamentary war is said to have fallen. Botanical and zoological gardens have been laid out in the vicinity of the city, and there are several extensive cemeteries, in which much taste has been displayed.

The diocese comprises the archdeaconries of Manchester and Lancaster. It was so constituted in 1818, but the title of a city was not conferred till 1853. Prior to the creation of the see the Cathedral was a collegiate church. The bishop's income is £4200, and his seat is at Bishop's Court, Higher Broughton. He has the patronage of thirty-six livings (as to most of them alternately with the crown). The dean has the patronage of eighteen livings.

**MANCHESTER**, a city of New Hampshire, United States of America, is pleasantly situated on the east bank of the river Merrimac, at the falls of Amoskeag, 18 miles S. of Concord, 59 miles N.W. of Boston. The town is laid out in broad elm-shaded streets, with five spacious public squares. A considerable trade is carried on in manufacturing cotton, prints, starch, paper, and locomotives. Water stored in a large reservoir and brought from a distance of 4 miles, is the chief source of power in the numerous mills and factories. The principal buildings and institutions are a town-hall, court-house, city library of 25,000 volumes, and numerous churches and banks. The population in 1880 was 32,630.

**MANCHINEEL TREE** (*Hippomane Mancinella*) is a tree 40 or 50 feet high, and of a handsome aspect, belonging to the order EUPHORBIACEÆ, and among the most poisonous of all known vegetable productions. When the fruit is ripe it is a fleshy yellowish-green round body, very like a European crab-apple. The tree is common in the West Indian Islands, Venezuela, and Panama, although pains have been taken to extirpate it. In some places it forms thick woods, as upon Sandy Island, near Tortola. The whole plant abounds in a milky juice of the most venomous description. Dropped on the skin it produces a sensation of severe burning, followed by a blister; and the fruit, when bitten, causes dangerous inflammation of the mouth. According to Sir Robert Schomburgk it is dangerous to sleep beneath the tree, and rain passing through the branches blisters the skin of a person below them. The wood of this tree is represented to be of fine quality, handsome, and well suited for cabinet-makers' purposes.

**MANCHURIA** or **MANCHOO'RIA**, a dependency of China lying between 38° 40' and 49° N. lat., and 120° and 133° E. lon.; its greatest extent from N. to S. amounts to 800 miles, its greatest breadth to 500 miles, and its area to about 400,000 square miles. The rivers Argun, Amur, and Usuri, up to Khingka (Hiuka) Lake, and a line thence drawn to the river Tumen, separate it from the Russian territories, the Shan Alin Mountains from Corea, and a barrier of stakes from Mongolia. In the south it borders upon the Gulf of Liau-tung and the Yellow Sea. The country is naturally divided into a mountain region in the north and east, and a plain region in the south. The Shan Alin Mountains in the south-east probably attain a height of 12,000 feet, and are said to be covered with perpetual snow and glaciers. The Khinghan Mountains, in the west, attain a height of 5000 feet. Crystalline rocks appear to predominate, but the cretaceous and tertiary formations are likewise represented, and the plains, notably that of Liau-tung in the south, consist of alluvial soil of great fertility. There are several extinct volcanoes, and an eruption is stated to have taken place during the last century to the west of Tsi-tsi-har. Coal has been discovered in many places, as well as iron, gold, silver, copper, and lead. The principal river is the Sungari. Its main branch, the Kirin-ula, rises in the Shan Alins, and after a northerly course of

250 miles joins the Nonni or Si-kiang (new river), in lat. 45½° N., the united stream assuming the name of Sungari, or Ta-kiang (great river), and entering the Amur in lon. 133° E. It is navigable as far as Kirin. The Usuri, which forms a portion of the eastern boundary, is regularly navigated by Russian steamers. The Sara-nuren or Liau-ho, enters the province of Liau-tung from the west, and flows southwards to the Gulf of Liau-tung.

Manchuria is divided into the three provinces of Tsi-tsi-har, Kirin, and Liau-tung. The capital is Moukden, situated in 41° 40' N. lat. and 130° 30' E. lon. The foreign commerce of the country is carried on through Yinkoa or Ying-tszu, the port of Niu-Chuang, the principal articles of export being beans and pease, bean-oil, and bean-cakes. This country can hardly be described any longer as the country of the Manchus, for these form now only a fraction of its population, having been swamped by Mantzi or Chinese immigrants, with whom they assimilate rapidly, so that even their language is likely to become extinct at an early date. The Manchus, meaning "pure," are a Tungusian race. They invaded China in the seventeenth century, and placed their leader's son on the throne of the Celestial Empire, which is still possessed by the Manchu dynasty. The population is about 4,000,000. The Russians first made their appearance in Manchuria about the middle of the seventeenth century. In 1666 they built Albazin, on the Amur, but by the treaty of Nerchinsk (1689) they were compelled to abandon their conquests. In 1850 the Russians resumed operations on the Amur, and by the treaty of Aigun (1858) the whole of the country to the north of that river, and both banks below the mouth of the Usuri, were ceded to them. Still further concessions of territory were made to them by the treaty of Peking (1860).

**MANCIPITUM**, in Roman law, signifies the right of property and of dominion which only Roman citizens could enjoy over their children, slaves, lands, and animals tamed for the service of man. The same word is used to designate the nature, character, and form of the sale by which such property could be transferred. It could take place only between Roman citizens, required five witnesses and certain prescribed formulæ. The property which formed the subjects of mancipium was *res mancipi*, and consisted of such things as would naturally form the wealth of an early agricultural people. All other things were *res non mancipi*, and property in these passed by mere *traditio* or delivery. The distinction between *res mancipi* and *non mancipi* was abolished by Justinian. Our word to *mancipate* (slaves) comes from this source.

**MANDÆANS**, the name of a small Oriental sect of South Babylonia, which represents almost the only surviving example of ancient Gnosticism. Their existence has been known since the middle of the seventeenth century, but it was not until the beginning of the present century that their peculiar beliefs and customs were made known to European scholars. Since then most of their sacred books have been published in Europe with translations, and their doctrines, which are a strange medley of old Chaldean heathenism, Parsism, and inverted Judaism and Christianity, have been investigated by students of comparative theology. They practise with oft-repeated frequency the rite of baptism, observe a sort of eucharist with the elements of bread and wine, and reverence a priesthood having three grades, a supreme bishop or "treasurer," an order of priests, and a subordinate order of deacons. Their places of worship were of a very simple character, and were arranged so that the worshippers should face the north, the Pole-star being regarded with peculiar veneration. According to their own accounts they were formerly very numerous, and when they were first discovered by European travellers they were estimated to number about 20,000 families. When they were visited a few years ago,



however, they had become reduced to about 200 families, and as they are disliked and persecuted by their Mohammedan neighbours, it seems probable that they will soon disappear altogether.

**MANDALAY**, the capital of Upper Burma, is situated 12 miles N.E. of the former capitals, Amarapura and Ava, and 3 miles E. of the river Irawaddi, from which only the golden spires of the pagodas can be seen. The city stands at the foot of the hill Mandalai, and consists chiefly of two fortified squares, the outer defended by high brick walls, with earthworks inside, and a deep moat, 50 yards wide, outside. There are twelve gates, with towers having gilded roofs. Guard-boats, sounding gongs, are passing all night along this moat. The houses are in separate inclosures, in well-kept wide streets, with latticed palisades in front. Business is carried on in open stalls, which are closed at night at the same time as the gates. There are a great many Buddhist monasteries, and many pagodas, with gilded domes and spires. West of the city there is an extensive suburb on low and level ground, liable to be flooded when the river is at its highest, traversed by many canals, and occupied also by extensive rice-fields. The houses of these suburbs are in separate gardens, inclosed by bamboo fences, 8 to 10 feet high, and surrounded by clumps of tamarinds and palms. The river and the canals are covered all day by boats passing to and fro. The trade with China is conducted by means of baggage mules, carrying gold, walnuts, pistachio nuts, opium, honey, wax, tea, preserved hams, iron pots, and yellow ornament. The city was founded in 1853 in order to be out of sight and hearing of the British steamers on the river. Since the British annexation of Upper Burma, in 1886, it has suffered very severely by incendiary fires, and also by floods caused by the bursting of the dykes confining the river, which had either by design or accident been suffered to go out of repair.

**MANDAMUS** (Lat., we enjoin) is a prerogative writ of a remedial nature, addressed to a person, sole or corporate, and not to the sheriff, as are ordinary writs. It is issued from the Queen's Bench division of the High Court, upon motion by counsel, founded upon proper affidavits, and it requires the person to whom it is addressed to do some act therein specified, which is generally one connected with his duty as a public official. The writ of mandamus is an effectual remedy, in the first place, for refusal of admission where a person is entitled to an office or place in a corporation; and secondly, for wrongful removal, when a person is legally possessed. A *peremptory mandamus* is a second one issued where the return of the first is insufficient. By recent rules of the supreme court it is provided that an *interlocutory mandamus* may be granted in any case in which it appears just or convenient.

In Scotland the Court of Session has not the same direct control over the proceedings of public bodies unless they be inferior courts. But the remedy, when competent, is by action of declarator, petition and complaint, suspension and interdict, or action of damages, according to the circumstances.

**MAN'DARIN**, the title used in all European languages to describe the Chinese officials of every grade. It is generally supposed to be derived from the Portuguese *mandar*, to command, a term derived from the Latin *mandare*; but some find its origin in the Sanskrit *mantrin*, counsellor, a term said to have been brought by the Portuguese from India. It is not used by the Chinese, their own term being *kwan*, which literally means "a public character." There are nine ranks among the civil mandarins, each distinguished by a different coloured ball or button, placed upon the apex of the cap, and by the ornaments worn upon the breast and girdle. These buttons are respectively ruby, coral, sapphire, a blue opaque stone, crystal, white shell, worked gold, plain gold, and silver. The mandarins are

theoretically supposed to receive office on account of their merit and learning, but in practice the titles and positions are chiefly obtained by purchase or favour, the customs of the Chinese resembling in this respect those of most Eastern and some Western countries. To preserve the unity of the empire civil mandarins are not allowed to hold office in their native provinces, and they receive their appointments for a few years only. A mandarin is also forbidden to marry in the jurisdiction under his control, or to appoint any near relative to office under himself.

**MANDATS** (territorial mandates), a kind of paper money issued in France at the time of the great Revolution, after the failure of the *assignats*, which had fallen to one-thousandth part of their nominal value by the end of 1795. The government of the Directory offered these mandates against the assignats at thirty for one, with the double design of creating an inferior denomination in the currency and concealing the terrible depreciation of paper money. It was made penal to purchase a mandat with gold or silver for less than its declared value. Holders of mandates could buy with them national (confiscated) land, upon mere ordinary contract, at the full value. This tangible good gave the people confidence for the time, and from being worth 15 francs, the 100-franc mandat rose to 80 francs, to the great relief of the government. The issue was enlarged till it reached the value of £100,000,000; but as the people soon found the mandat valueless abroad and only exchangeable for full value in the case of national land at home, this redundant issue had its legitimate effect, and it was not long before they had sunk to the value of the old assignats. In fact, they were issued at a great deal too high a nominal rate, the assignats having sunk not to one-thirtieth but to one-thousandth of their value. The only result, therefore, was that in a few months the nominal value of the currency was reduced by one-thirtieth, the real value or valuelessness being unaltered.

Currency on such terms was impossible, and barter quickly took the place of sale. Those who had any property obtained in exchange for it exchangeable commodities, and the great houses were full of silks, velvets, &c., which were exchanged for what was required day by day, and upon this slender and primitive basis trade began to revive, till the arrival of plundered gold from the armies of Flanders, Italy, and Germany gave once more a medium of exchange. Mandats were to be found only in the hands of speculators, who sold them for cash at one-twentieth the nominal value to those who desired to buy the national domains, since for this purpose they were still available at their full value (1796). Finally, on 16th July, 1796, the Directory confessed themselves beaten, and a decree permitted all people to transact business in the money they chose. A daily list of the real value of mandates by the exchange was published, and the mandates or cash were taken at government offices. The land was only purchasable thenceforth at the real, not nominal values of the mandates. So ended the famous French paper money. The assignats lasted nearly five years, the mandates less than one. These six years brought about more changes in the fortunes of individuals, it is believed, than ever occurred in the same space of time. All debts were, in fact, practically annihilated, and anyone became a landholder who chose.

**MANDELIC or FORMO-BENZOILIC ACID** is obtained by the action of fuming sulphuric acid on the oil of bitter almonds. The formula is  $C_{10}H_{10}O_6$ , containing the elements of the oil and formic acid ( $2C_2H_5O + 2CO_2H_2$ ). It crystallizes in rhombic needles, having an odour of sweet almonds, and melting by heat into a yellow oil. It is very soluble in water, and in alcohol and ether. It forms a number of salts called mandelates.

**MANDEVILLE, BERNARD DE**, was born at Dort, in Holland, about 1670. He took the degree of



Doctor of Medicine in Holland, and afterwards practised his profession in London. He does not appear to have had much success as a physician. His first work, "The Virgin Unmasked, or Female Dialogues betwixt an elderly maiden Lady and her Niece," was published in 1709. In 1714 he published a short poem, called "The Grumbling Hive, or Knaves turned Honest," to which he afterwards added long explanatory notes, recast it in prose, and then published the whole under the new title of "The Fable of the Bees, or Private Vices Public Benefits." This work, which, however erroneous may be its views of morals and of society, bears all the marks of an honest and sincere inquiry into an important subject, exposed its author to much obloquy; as did also some other works which he wrote. Mandeville's ethical theory, if it may be called ethical, and is not to be rather taken as a long cynical piece of irony, is indicated by the sub title of his work. What is called vice is, he says, for the public benefit. There is no profitable distinction to be drawn between the springs of action; all are alike, neither good nor bad in themselves, but natural. The welfare of society is best conducted by giving all impulses their due indulgence. The restraints of the priest and the magistrate are facitious, usurping, and unnatural. Mandeville denies unselfishness to be possible. Virtuous men do benevolent actions, he says, as they enjoy other pleasures, for the sake of their own enjoyment in them. Every one seeks his own happiness; but rules are necessary to join together against common enemies, each one giving up as little as possible of his personal liberty. There is much that is unhappily too true in Mandeville, if he is taken as sketching man's actual state rather than the ideal state towards which (we hope) he is slowly tending. He stands as the extreme type of the "selfish theory" in morals. He died 21st January, 1733, aged sixty-three.

**MANDEVILLE, SIR JOHN DE**, the name taken by the compiler of a very popular book of travels, which was written in French, and published between 1357 and 1371. According to the writer's own account of himself, he was born at St. Albans about 1300. Having studied medicine he started in 1322 on a journey to the Holy Land, which he afterwards extended to other parts of the world. He was thirty-four years on his travels, during which he visited Turkey, Scythia, Armenia, Egypt, Libya, Arabia, Syria, Media, Mesopotamia, Persia, Chaldea, India, China, and Tartary. His experiences during this prolonged journey were of a most remarkable character, and having, in spite of many dangers, reached home in safety, he wrote an account of his travels in order to alleviate the pains of gout by which he was tormented. The book was received with much favour in its original French form, and translations were soon made in other languages, an English version appearing about the beginning of the fifteenth century. It was first printed in Italian at Milan, in 1480, and the first edition printed in England is that by Wynkin de Worde (Westminster, 1493). For a long period the book retained its popularity and was regarded as an authentic and valuable account of the countries referred to, but after the seventeenth century it began to be seriously questioned, and finally its author became, in the popular imagination, a sort of Baron Munchausen, and his name was used as a symbol of superlative mendacity. In more recent times it has been shown that the largest portion of the narrative has been taken without acknowledgment, and passed off as personal experience, from the works of earlier travellers and writers, that many of the details are derived purely from imagination, and that the only portion of the book which seems to have been derived from personal experience is that which relates to Egypt and Syria. At the same time the book contains much that has been verified by more recent travellers, and it is written throughout in a very interesting manner. The best modern edition of

the English version is that of J. O. Halliwell (London, 1839, reissued 1866).

**MAN'DIOC** or **MAN'TOC**, the American name of the **CASSAVA** plant, which furnishes the inhabitants of tropical America with a farinaceous food. There are two varieties: one called the sweet, the other the bitter. From the starch of the latter tapioca is prepared by washing and granulating on hot plates. This shrub, known as *Manihot utilisima*, grows to a height of from 5 to 9 feet. The bitter variety in its raw state is poisonous. The plant usually grown as sweet cassava is considered by Mueller to be a variety of this species, *Manihot palmata*. *Manihot* belongs to the order **EUPHORBIACEÆ**. See **PLATE MARANTA AND MANIHOT**.

**MAN'DOLINE**, a musical instrument the lute kind, but smaller, and with a deeper body, having four pairs of strings, which are tuned in the same manner as those of the violin. The finger-board is crossed by seventeen frets; the instrument is usually played with a plectrum. The mandoline is still met with occasionally in Italy, but has fallen into disuse in most other parts of Europe. The Milanese mandurina has five pairs of strings. It will be remembered that the exquisite serenade in "Don Giovanni" was intended by Mozart to be accompanied on the mandoline; the usually substituted *pizzicato* of the violins is a bad exchange. The scale is three octaves and a note, from *g* to *a''* in the second octave above the treble staff.

**MAN'DRAKE** (*Mandragora officinarum*) is a plant which has been famous from the earliest times. It is nearly allied to belladonna, and possesses also properties which



Mandrake (*Atropa mandragora*).

are narcotic, emetic, and purgative, and, in large doses, poisonous. Shakspeare alludes to this plant in "Antony and Cleopatra:" "Give me to drink mandragora;" and probably also in "Macbeth:" "Or have we eaten of the insane root that takes the reason prisoner?"

The form of the root, resembling the lower part of the human body, has excited much superstition, which Shakspeare alludes to in "Romeo and Juliet:"—

"And shrieks like mandrakes torn out of the earth,  
That living mortals, hearing them, run mad."

The form suggested to credulous minds like Rachel's that it would produce fruitfulness, and in ancient times it was commonly used as a love-potion.

**MANDRILL** (*Cynocephalus mormon*) is the largest and most powerful of the dog-shaped apes or Baboons. The mandrill is a native of Guinea and other parts of Western Africa, where it is greatly dreaded by the natives, who assert that it frequently attempts to carry off women into the forests, and occasionally succeeds. Its history has been greatly confounded with that of the CHIMPANZEE, and the names of Smitten, Choras, Boggo, Barris, &c., according to the dialects of different tribes, appear to be applied by the older travellers to both animals without any distinction. It usually associates in troops, which are more than a match for the most powerful beasts of prey, and which are said even to attack and drive away the elephants from the precincts of their residence. Like the other baboons they inhabit open rocky regions rather than forests. Though quadrupedal their activity is very great, and they leap and climb with the utmost facility. Not only do they make incursions into cultivated fields, but they are said to watch their opportunity and enter the villages, which they plunder of everything eatable, leisurely retreating with their booty. The natives dread them, and unless in strong bodies and well armed, fear to pass through the regions frequented by them. Their voice is deep and guttural, consisting of abrupt hoarse tones, indicative of fury or malevolence.

Before the mandrill arrives at maturity it undergoes several changes, particularly remarkable in the male, and which have led to the multiplication of species. When adult, the general colour of the male is olive brown, passing into whitish on the under parts. A golden yellow beard hangs from the chin; the hair of the forehead converges to a peak. The nostrils have a broad rim round them at the extremity of the long muzzle. The tail is short and nearly hidden by the fur, and the callosities are large and of a bright red colour. The cheek-bones are enormously swollen, rising like two ridges; the skin of the cheeks is obliquely marked by deep furrows, and the colour is a deep blue, passing into rich scarlet down the furrows; a streak of brilliant vermillion, commencing on the beetling superciliary ridge, runs down the nose, and is diffused over the muzzle. The hands and feet are naked and black. The upper canines are of immense size; the lower jaw is enormously powerful, and armed with sharp canine teeth; the surface of the skull exhibits strong ridges for the attachment of the muscles, and no one who looks at the entire skull of a mandrill can doubt for a moment that the creature possessing such formidable weapons, and such powerful means of setting them in motion, would be as terrible an antagonist as almost any beast of prey. A full-grown male measures 5 feet when standing upright. In the female the muzzle is shorter, the cheeks are much less swollen than in the male, and the scarlet is either pale or wanting.

In the young males the cheeks are little if at all swollen; the furrows barely perceptible, and the colour black. It is not until the fourth or fifth year, when the second dentition is complete, that the characters of maturity are assumed; and to this point the process is gradual, the bones of the face developing, the colour of the skin changing, and the muzzle becoming broader and thicker, and the furrows more and more marked.

In a state of nature the mandrills live principally upon fruits and insects, although, like other baboons, they doubtless often devour small animals. In captivity they eat almost anything, and usually acquire a strong taste for intoxicating liquors. A fine specimen which was exhibited many years since, and which had retained his youthful tractability to a later period than is usual with male baboons, was in the habit of drinking his pot of porter

daily, accompanying this indulgence with a pipe, which he smoked with great gravity whilst sitting in a chair. The name mandrill seems to signify a man-like ape, drill being an old name for ape or baboon.

**MA'NES**, the name given by the Latins to souls separated from the body, who haunted the resting-place of the departed, and there received food and drink from the survivors at stated times. In their character of protectors of the house and family the spirits were also worshipped as LARES. The etymology of the word is uncertain; it is generally derived by ancient grammarians from an old word, *manus*, signifying good, probably in the same deprecatory sense as the Furies were called Eumenides by the Greeks. Public rites in their honour took place in the month of February, the *Parentalia*.

The stones in the Roman burial-places, and their funeral urns, were generally inscribed with the letter D.M.S., that is, *Dis Manibus Sacrum* (sacred to the Manes-Gods). There are many specimens of such funeral inscriptions in the British Museum. Frequently D.M. only was used; and this has been curiously taken advantage of at the cemetery of the "Aliscamps" (*Elisei Campi*) at Arles by the early Christians. They, having depopulated the rich and numerous sarcophagi of ancient Romans, used them for the bodies of their friends, inserting the letter O as well as they could, so that D.M. became D.O.M., the Christian monogram *Deo Optimo Maximo*.

**MAN'ETHO**, more properly *Manethon*, an Egyptian writer, a native of Diospolis, lived in the time of Ptolemy I. He was a man of great learning, a priest, and interpreter or recorder of religious usages, and of the religious and probably also historical writings.

The only work of Manethon which has come down to us complete is a Greek poem, in six books, in hexameter verse, on the influence of the stars ("Apotelesmatika"), which was first published by Gronovius (Leyden, 1698). It is very doubtful whether this is genuine or not. There are considerable fragments of a far more valuable Greek work of Manethon on the history of the ancient kings of Egypt. It comprised the period from the earliest times to the death of the last Persian Darius. Manethon derived his history of the kings of Egypt, whom he divides into thirty classes called dynasties, from the sacred records in the temple at Heliopolis.

**MAN'FRED**, natural son of the Emperor Frederick II., was appointed by his father at his death, in 1250, regent of the kingdom of the Two Sicilies, until the arrival of his brother Conrad, the legitimate son and heir of Frederick. Upon the death of Conrad, and the reported death of Conradin his son, Manfred was invited to assume the crown, which he retained by general consent, even after it was discovered that Conradin was still alive. But Manfred had to contend against the see of Rome, by which he was excommunicated. Urban IV. treated Manfred as a usurper, and bestowed the crown upon Charles, count of Anjou, brother of Louis IX. of France. Charles marched an army into the dominions of Manfred, who was killed under the walls of Benevento, 26th February, 1266. Manfred was a warm and enlightened patron of letters, was himself a poet, and is praised by the Neapolitan chroniclers for many great and noble qualities.

**MANGA'BEY** is the name given to a small group of monkeys, from the mistaken idea that they inhabit Madagascar. The mangabeyes are very closely allied to the GUENONS, and may be placed in the same genus (*Cercopithecus*), though some prefer to distinguish them generically under the name *Cercocebus*. They are distinguished from the guenons by having a fifth cusp on the last molar in the lower jaw, and also by having the hands and feet webbed, the web between the second and third toes of the foot reaching almost to the tip, and between the other toes and fingers as far as the first joint. They are also charac-

terized by the dead white colour of the upper eyelids, which gives them a very singular appearance. They resemble the gnomes in general form, length of tail, and habits. They are all African. In captivity they are exceedingly agile and frolicsome.

**MANGALORE** (Hindu, *Mangala*, fortunate), the chief town of South Kanara district, Madras, with a population of 30,000. It is a seaport, municipality, and military station, with courts, church, custom-house, and military offices; post and telegraph station. The town is picturesque, clean, and prosperous. The native houses are laid out in good streets, and the European quarter is particularly pleasant. Like all the towns on the Malabar coast, Mangalore is buried amid groves of cocoa-nut palms. The municipal commissioners have done much towards improving the town, and have established a handsome market. Situated on the back-water formed by the convergent mouths of the Netravati and Gurpur rivers, it has water on three sides of it. Large vessels cannot cross the bar into the harbour, but Arabian dhonies and country craft enter in considerable numbers. Mangalore clears and exports all the coffee of Coorg, and trades directly with Arabia and the Persian Gulf. There is a large native Roman Catholic population, with two European bishops, several churches, and a convent. The Basel Lutheran Mission has its headquarters here, and has done much good in teaching trades, &c. Mangalore, which in the sixteenth century had been three times sacked by the Portuguese, was subsequent to 1640 a stronghold of the Ikari or Bednur rajahs. When that dynasty succumbed to Hyder Ali, Mangalore was occupied by the latter (1763), and became the headquarters of his new navy. In 1768 the English held Mangalore for a short time; and in 1783 the fort was gallantly defended by an English garrison against overwhelming odds, but was taken by Tipoo, after a nine months' siege. In 1799 Mangalore became British territory, and since that time it has only once been disturbed by the appearance of an enemy—namely, during the Coorg insurrection in 1837, when the rebels entered the town, burnt the Cutcherry, and then retired.

**MANGANESE**, a metal discovered by Scheele in 1771. The principal ores present it in the form of peroxide or black oxide of manganese, but it is also found as carbonate, sulphide, and silicate. It is obtained from the protoxide by reducing it with charcoal at a very high temperature. It is a grayish-white metal resembling cast iron, and very brittle. The specific gravity is 8, the atomic weight is 55, and the symbol Mn. It requires the strongest heat of a powerful blast furnace for its fusion. It furnishes on exposure to the air, and decomposes warm water with evolution of hydrogen, but when alloyed with iron it is malleable. It forms a number of alloys with other metals, of which the most important is that with iron, known as spiegeleisen or ferro-manganese, largely used in the Bessemer process of making steel; an alloy with copper is also used under the name of manganese bronze. There are four well-defined oxides of manganese—protoxide or manganous oxide,  $MnO$ ; manganous manganic oxide,  $Mn_3O_4$ ; sesquioxide or manganic oxide,  $Mn_2O_3$ ; and dioxide or peroxide,  $MnO_2$ . The protoxide is a green powder; when precipitated from solution by an alkali it is thrown down as a white hydrate. Both dissolve in acids forming manganous salts. The manganoso-manganic oxide, or red oxide of manganese, is also found native as Hausmannite. It is always produced when either of the higher oxides are ignited. The sesquioxide is found native as braunite, and as a hydrate or manganite; while

The peroxide, in the native form, is known as pyrolusite, and is the principal ore and source of manganese. It is obtained from Spain, Germany, and Devonshire. It usually contains 75 to 88 per cent. of peroxide of iron of good quality. It is a black crystalline mineral of metallic lustre, having a

specific gravity of 4.8. It gives off part of its oxygen when heated, and is reduced to manganic oxide. It is the usual source of oxygen gas, and is employed largely as an oxidizing agent in manufactures. The most important of these is the development of chlorine from hydrochloric acid, the important commercial products bleaching powder and chlorate of potash being entirely made from chlorine so obtained. So extensive is its use in this industry that an elaborate and most successful process has been devised by Weldon for regenerating the oxide of manganese. This process, known as the Weldon process, is now almost universally employed in the chlorine manufactures. See CHLORINE.

Two oxygen acids of manganese are also known—manganic acid and permanganic acid. The former does not exist in a separate state, but permanganic acid ( $Mn_2O_8H_2$ ) has been obtained as a greenish-black liquid. It is a most powerful oxidizing agent, instantly setting fire to paper and to alcohol. The manganates, of which potassium manganate ( $MnO_4K_2$ ) is the best known, are green crystalline salts, soluble in water. The permanganates, of which potassium permanganate ( $MnO_4K_2$ ) is the most common, are deep purple crystalline salts; these are much more stable than the manganates, and are the oxidation-result of these salts. When potassium manganate is dissolved in a large quantity of water, it is resolved into hydrated manganese oxide, which subsides, and potassium permanganate, which remains in solution, the colour changing from green to purple, hence the manganate is called "mineral chameleon." Both are powerful oxidizing agents, and are well-known as disinfectants, under the name of Condy's fluids.

*Manganese or manganous chloride* ( $MnCl_2$ ) is a large by-product in the manufacture of chlorine. It is a pale rose-coloured salt, very soluble, and very deliquescent. Manganous bromide ( $MnBr_2$ ) and manganous iodide ( $MnI_2$ ) have similar properties. Manganous fluoride ( $MnF_2$ ) is an insoluble salt. Manganous sulphate ( $MnSO_4 \cdot 7H_2O$ ) is a very soluble rose coloured crystal isomorphous with magnesium sulphate. It is used in dyeing to produce a permanent brown on cloth, and for imparting siccative properties to linseed oil. It is more soluble in cold than in hot water. Manganous carbonate ( $MnCO_3$ ) is an insoluble white powder. Manganese borate is also used in dyeing.

Manganese salts are readily detected by the blowpipe, giving with borax an amethyst-coloured bead in the outer flame, and a colourless one in the inner flame; and yielding a green mass when treated with sodium carbonate. In solution manganese gives a characteristic flesh-coloured sulphide with ammonium sulphide. Some of the salts of manganese, especially the sulphate, are used in medicine as purgatives and tonics.

**MANGANESE ORES** of commercial importance are mostly oxides, in some cases hydrated. The most valuable ores are *pyrolusite*, *psilomelane*, and *wad*.

The most abundant ores are *Pyrolusite* or binoxide of manganese ( $MnO_2$ ); it is of a blackish-blue colour, and generally occurs massive or in concentric kidney-shaped nodules; it has a hardness of about 2, and specific gravity of about 5.

*Manganite* is a hydrated sesquioxide of manganese ( $Mn_2O_3 \cdot H_2O$ ); it is of a dark color, and occurs in long rhombic crystals.

*Psilomelane* is a hydrous peroxide of manganese, but it also contains several other substances (as baryta), which lessen its value as a commercial ore. It generally occurs in botryoidal and stalactitic forms.

*Wad* is an earthy ore resembling psilomelane in composition; it is very common in many rocks in small quantities, and is the substance which mostly forms the dendritic markings on slates and other fossil rocks, and is used for umber paint.

Other manganese minerals that may be mentioned, but which are seldom of commercial importance, are Hausmannite ( $Mn_3O_4$ ); Braunnite, a sesquioxide ( $Mn_2O_3$ ); Diallogite, the carbonate ( $MnCO_3$ ), but usually containing indefinite proportions of other carbonates; and Rhodonite, a silicate of manganese ( $MnO SiO_2$ ).

**MANGE** (Fr. *démanger*, to itch), an eruptive disease to which many domestic animals, and particularly dogs, are subject. It is usually due to the attacks of mites burrowing in the skin as the result of dirt and confinement, bad or deficient food, or some other circumstance producing a generally unhealthy condition.

**MAN'GO** (*Mangifera indica*) forms one of the most grateful fruits of the tropical parts of Asia. In the nurseries they are much used for preserves and pickles. The trees grow to a great size, with an erect trunk and dark coloured cracked bark. The wood is of a whitish or a dull gray colour, potous, yet pretty durable if kept dry. It is used by the Hindus, together with sandal-wood, in burning their corpses. See ANACARDIACEÆ.

**MAN'GOLD WUR'ZEL** or **MAN'GEL WUR'ZEL**, the root of a variety of BEET, which is cultivated for the food of cattle, and for its saccharine juice. The word mangold was first applied to this variety, but for what reason is unknown. It was at length corrupted into *Mangel*, the German for scarcity, so that *Mangel wurzel* means *scarcely root*.

**MAN'GONEL**, one of the military engines of the middle ages, for hurling huge stones by means of the torsion of ropes.

**MAN'GOSTEEN** (*Garcinia Mangostana*) is considered one of the most delicious of all fruits. It is a native of the Malay Islands, forming trees of considerable size, with a straight trunk and numerous spreading opposite branches, forming an elegant conical head. The tree is considered one of the most ornamental in Batavia for gardens, and also as affording an agreeable shade. So wedded is it to its indigenous soil and climate, that the innumerable attempts made to cultivate it in India and other tropical countries have not succeeded well. But in 1855, it flowered and ripened its fruit in the gardens of the Duke of Northumberland. The flower is of a dull red colour, about as large as dog roses. The fruit before ripening is slightly astringent. The rind is powerfully astringent, and its decoction is employed in dysentery and as a gargle in slight ulcerations of the mouth. The ripe fruit is about the size of a small orange, and is of a reddish-brown colour. The rind is a quarter of an inch thick, and when this is removed, the edible portion appears in the form of a juicy pulp, as white as snow, and melting in the mouth like ice cream; the taste has been compared to a mixture of peach, pine apple, and many other delicate flavours. It is not luscious, and may be eaten by invalids to any extent. The bark of the trunk and branches are considered astringent, and are employed by the Chinese in dyeing. See GUTTIFERÆ.

*Oil of Mangosteen*, or Kokum Butter, is prepared from the seeds of *Garcinia indica*, a native of the Concan coast of India. It is well adapted for use in pharmacy. Some of the species of *Garcinia* produce GAMROGÆ.

**MAN'GROVE** (Rhizophora) is a genus of plants which gives its name to the order RHIZOPHORÆ, or the mangrove family, the plants of which are remarkable for their seeds germinating even while attached to the branches, and also for the numerous adventitious root-like projections which serve as supports for the stem. The common mangrove and also others of the genus are found all along the shores of the tropics, both in the new and old world, rooting in the mud, and forming dense forests even at the verge of the ocean, and below high-water mark; hence, on the retiring of the tide, the stems may often be seen covered with oysters and other shell-fish. Wallace, in his

"Tropical Nature," in speaking of these trees, says that they "greatly aid the formation of new land, as the mass of aerial roots which arch out from the stem to a considerable distance collects mud and floating refuse, and so raises and consolidates the shore; while the young plants, often dropping from the furthest extremity of the branches, rapidly extend the domain of vegetation to the furthest possible limits. The branches, too, send down slender roots like those of the banyan, and become independent trees. Thus a complete woody labyrinth is formed, and the network of tough roots and stems resists the action of the tides, and enables the mud brought down by great tropical rivers to be converted into solid land far more rapidly than it could be without its aid."

**MANGUE** (*Crossarchus obscurus*) is a small carnivorous mammal belonging to the same family (VIVERRINÆ) as the civets. The mangue has a thick, stout body, long tail, a long flexible snout, and small round ears. The feet are plantigrade and furnished with five toes. In the anal region there is a solitary glandular pouch, the secretion from which is very fetid. The body is only 16 inches in length, not including the tail, which measures some 8 inches. The fur presents a tolerably uniform brownish colour, except on the sides of the head, where it is much paler. The mangue feeds on small quadrupeds, insects, and fruits. It is a native of tropical Africa. In captivity it is very docile.

**MAN'HEIM** or **MANN'HEIM**, a town of Germany, in the grand-duchy of Baden, situated on a very fertile plain, at the junction of the Neckar with the Rhine, and had 53,465 inhabitants in 1881. Over both rivers there are bridges of boats, and the town is connected with Ludwigshafen, on the opposite bank of the Rhine, by a railway bridge, which is also used by carriages and foot-passengers. Mannheim is built with great regularity; it consists of several squares and of broad straight streets that cross each other at right angles. The town has quite a modern air, having been almost entirely reconstructed since the close of the last century, when the French were obliged to surrender it to the Austrians after a bombardment which laid the greater part of it in ruins. The principal street leads from the Neckar Gate to the palace of the grand duke, built in 1720, which is a vast edifice. The right wing contains a gallery of pictures, a cabinet of natural history, a collection of plaster casts of the most celebrated antiques, and a library of 60,000 volumes. Mannheim has also several Lutheran and Roman Catholic churches, an observatory, and a botanic garden. The fortifications having been entirely demolished by the French, and the site subsequently converted into gardens, the inhabitants enjoy the benefit of beautiful promenades, besides the fine park of the palace, which is nearly 200 acres in extent. There are manufactories of tobacco, shawls, linen, and playing cards, besides bleaching-grounds and tanneries. There is an active trade by the rivers and railways, the latter connecting it with the chief towns of Germany. The harbour measures 2300 yards in length, and is the largest of the kind in Germany.

**MANICHÆISM**, a system of religion founded in the third century of the Christian era by a Persian named Mani, which afterwards became very widely diffused throughout both the Eastern and Western worlds, and the influence of which can be traced in connection with the Christian church as late as the thirteenth century. Until recent years the Manichæans were always regarded as a heretical Christian sect, but it is now known that this description is incorrect, and the independent origin of Manichæism has been fully established by the labours of modern scholars. Much obscurity rests upon the life of the founder of the system, and in searching for information most historians now depend chiefly on the Oriental or Mohammedan traditions which have been preserved, which appear from internal evidence to be more trust-

worthy than those derived from Western sources. Omitting much that is obviously legendary, it appears that Mani was a descendant of a good Magian family of Ecbatana, and was born about 215-216 A.D. He was carefully educated by his father and brought up as a member of the Babylonian sect of the "Moghtasilah," which represented one of the later developments of the old Chaldean religion. The first centuries of the Christian era were periods of much religious excitement; the old systems of heathenism were in rapid decay, and in many directions thoughtful men were striving either to spiritualize, change, and transform them so as to bring them into harmony with the advancement of knowledge, or to establish new systems of religion and philosophy in their place.

From the circumstances of his training and surroundings Mani could not fail to become acquainted with several different forms of religion, and being a man of ardent temperament, lively imagination, and strong mental powers, it is not wonderful that he should endeavour to found a new system in which should be combined the best of the old and the new teaching. His earliest public efforts were made at the commencement of the reign of the Persian king, Sapor I., who is said at first to have received him with favour. He claimed to be the bearer of a new divine revelation, to be, as Mohammed claimed at a later period, the last and highest of the prophets, and to be commissioned by God to establish the perfect religion throughout the world. He gained many disciples, and extended his influence by missionary journeys to China, India, and Turkestan, returning to Persia in the closing years of the reign of Sapor. He was allowed to continue his teaching for a time unmolested, and he was favoured and protected by Hormuz, the successor of Sapor, but he aroused the hostility of the Magians, and under Bahram I. he was crucified in the year 276-277. It is said also that his skin was exhibited before the gate of the city Djondishapur to terrify his followers, and according to some accounts he was not crucified, but flayed alive. He was the author of numerous works, which he composed partly in the Persian and Syriac languages, and partly in an alphabet of his own invention (the latter being afterwards used by his followers for their sacred books), but none have come down to modern times.

After the death of Mani his system spread with much rapidity, and it soon became known throughout the whole of Persia, Mesopotamia, and Transoxania. It reached the Greek Roman empire about the close of the third century, and by absorbing within itself some of the elements of Gnosticism and also of Christianity, it had become an opposing influence to the latter by the middle of the fourth century, both in Europe and North Africa. Its adherents were soon subjected to persecution, and according to some authorities the Emperor Diocletian, as early as 296, issued severe edicts against them as being members of a Persian sect hostile to the empire. The Christian Byzantine and Roman emperors enacted strict laws against them, and in North Africa they were persecuted by the Vandals. Ultimately they were outwardly suppressed in Europe, though their doctrines were long secretly taught, and their influence may be traced in the formation of several of the sects of the mediæval period. In the East they had also to encounter much persecution, but in spite of this they gained a firm footing in many countries of Asia; and even after the rise of Mohammedanism the system seems to have gained many secret adherents from among the followers of the prophet.

The speculative theological doctrines of Manichæism, like those of most other systems, passed through numerous modifications during the history of the sect, but they seem in the first instance, to represent the later philosophic form of the old Semitic nature-worship in combination with Parsism and certain elements of Judaism and Christianity.

Its fundamental principle was the doctrine of an absolute dualism in the universe, which is regarded as the battleground between God and the kingdom of light, and Satan and the kingdom of darkness. The world with its mingled good and evil represented the result of a battle between God and Satan, in which certain of the elements of the kingdom of light had become mingled with those of darkness. The first human beings, though they had buried within them a portion of the divine light, were yet under the influence of the prince of darkness, and it had been the work of the heavenly powers since the creation of the world to set free this divine element and redeem it from imprisonment by bringing man into harmony with the kingdom of light, the demons trying all the time to prevent this consummation. By the good spirits prophets had from time to time been sent into the world to enlighten men and lead them to the true knowledge, among whom were Adam, Noah, Abraham, Moses, Jesus, and Paul, possibly also Zoroaster and Buddha, but the last and highest was Mani himself, who represented the Paraclete promised by Jesus. Like Mohammed, however, Mani distinguished between the Jewish prophets and Judaism, and between Jesus and Christianity, rejecting the Old Testament Scriptures unconditionally, and only accepting certain portions of the New Testament, which were revised and redacted by himself.

Jehovah, the God of the Jews, was regarded by the Manichæans as an evil spirit and a servant of the prince of darkness, while Jesus was resolved into a spiritual being, whose sufferings and death were only apparent, and endured as affording an example to his followers.

Asceticism was regarded in the Manichæan system as being the chief method whereby the earthly, sensual element in human nature could be subdued, and its rules in this respect were very exacting. To subdue the material elements of darkness, and to attain to spirituality and light, it was necessary to abstain from all flesh, eggs, milk, fish, wine, and all intoxicating drinks; from hurting any living being, and from killing any plant; to practice celibacy, and preserve strict continence; and to fast frequently. As in the Christian church, however, believers were divided into two classes—clergy and laity—and a higher standard of morality was required of the former than of the latter. The two divisions of the Manichæans were designated the elect and the hearers, the former representing the priesthood or clergy. There were altogether five gradations in the system, the highest being that of the "teachers," of whom there were twelve, one of the twelve being recognized as chief or pope. For some centuries the seat of the pope of Manichæism was at Babylon; at a later period it was at Samarkand. Next in rank to the teachers came the "administrators" or "bishops," of whom there was a larger but still very limited number; then came the "elders" or "presbyters," followed by the *clerk*, and finally the great mass of the members, called the "hearers." The hearers were not required to realize the high degree of asceticism required of the elect, and were allowed to live pretty much as other people; but they were forbidden to kill any living thing, were required to abstain from idolatry, sorcery, fornication, falsehood, avarice, &c., to observe fasting and prayer, and to support the members of the elect. The worship of the Manichæans seems to have been for the most part of a simple character, but they had some ceremonies peculiar to the elect which are said to have resembled the sacraments of Christianity, though of these very little is known. Augustine, who was for nine years a Manichæan "hearer," and whose writings contain much valuable information concerning them, says he was ignorant as to the manner in which their sacraments were observed. They seem to have possessed, during the later periods of their history, an extensive collection of sacred writings, but these were always a special mark for their

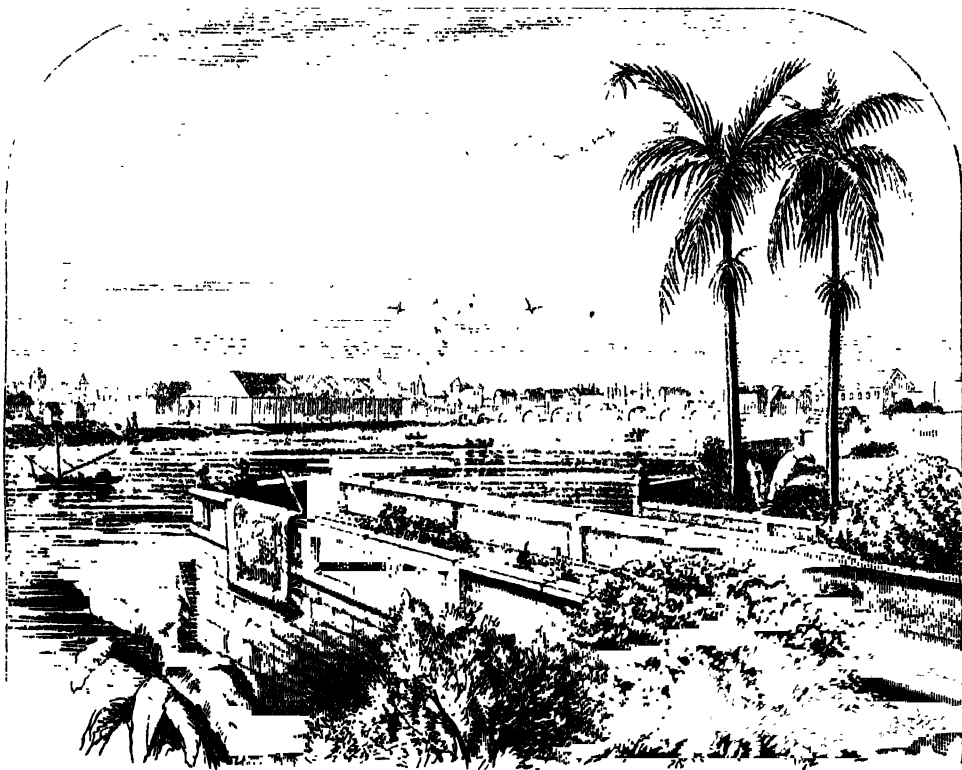
enemies during their periods of persecution, and only a few fragments are known to modern scholars. It is generally believed that the peculiar doctrines of the Panicians, Bogomiles, Catharists, and even Albigenses in the Christian church, are to be traced to Manichean influence.

**MANIFEST.** A ship's manifest is the formal statement of her cargo for the use of the customs officers. It usually contains a list of all the packages on board, with their marks, &c.

**MAN'IHOT.** See **TAPIOCA.**

**MANIL'LA,** a fortified seaport city of the Philippine Islands, and the capital of the Spanish settlements in the East, situated on the east side of the Bay of Manila, on the island of Luzon, and on the river Passig, about half a mile from its mouth. The bay and city of Manila have a very picturesque and imposing aspect from the sea. The former is surrounded by mountains covered with verdure,

which, on the east, decline gradually towards the shore. The city itself is connected by a bridge of ten arches, and by a suspension bridge, over the navigable river Passig with the trading suburb of Binondo. The harbour is sheltered by a bar, and the prolongations of the pier into the bay are crowned, the one with a fort, the other with a lighthouse. The region is frequently visited by earthquakes. The last important one occurred in 1880. The chief lesson then taught was the danger of tiled roofs, and Manila is now rapidly assuming the appearance of a new colonial, corrugated-iron, white-roofed town. Security for the main building is sought for in one of two extremes—solidity or lightness. A massive ground storey of stone built on arches, surmounted by a superstructure of iron framework, and the bamboo and straw houses of the natives are equally secure. The place of glass in the windows is supplied by thin semitransparent pieces of shell,



Manilla.

which, though more opaque, repel heat better. The chief buildings are the cathedral, St. Thomas' University, the College of St. Joseph, the royal marine school, and the government cigar factory; and in the Plaza is a bronze statue of Charles IV. It is the chief port in the Philippines, is open to all nations, and its harbour was improved in 1880 by the construction of a breakwater. The chief imports are cottons, woollens, silks, haberdashery, medicines, clocks, jewelry, &c. The principal exports are sugar, cigars and tobacco, hemp, indigo, rice, dye-stuffs, mother-of-pearl, rum, &c. The trade is increasing, notwithstanding the vexatious restrictions of the government, a circumstance that may perhaps be explained by the fact that, as always when commerce is interfered with to too great an extent by the law, the free use of bribery makes the law less onerous in practice than in theory. The

climate is healthy. The population of the city is about 100,000, and of the suburbs 50,000. Manila existed as a native town prior to the Spanish invasion; it was taken by the Spaniards, and made the capital of their Eastern dominions, in 1571.

**MANIL'LA HEMP.** See **ARACA.**

**MANIN', DANIEL,** President of the short lived Venetian Republic of 1818-49, and a patriot of sterling force and elevation of character, was born at Venice on the 13th of May, 1804, the son of Pietro Manin, an advocate in that city. He was educated for his father's profession, and in the principles of pure republicanism. At seventeen he took the degree of LL.D. at Padua, and in 1830 settled as an advocate in Mestre, a suburb of Venice. His sympathy with the party of liberty and unity in Italy was expressed by speech and in writing on various occasions fearlessly,

but with a wise prudence that kept him always within the law of the land. In 1847, during the ferment that followed the accession of Pope Pius IX., Manin petitioned the authorities of Milan to grant those reforms which had long been the demand of liberal men in Italy. The Austrian government arrested the writer as a promoter of sedition when the revolution broke out; and on the 17th March, 1848, Manin was liberated by the people and carried in triumph round St. Mark's Place. Six days afterwards the republic was proclaimed, and Manin appointed president. Against his wish annexation to Piedmont under Charles Albert was voted in the Assembly, and he resigned his office. After the victories of the Austrians in Lombardy he was recalled to his post, with the powers of a dictator. Dark days for him and for Venice were approaching. On the 2nd of April, 1849, Manin explained to the Assembly the perilous situation of the republic, and a unanimous vote was given for a persevering resistance to Austria. At the head of the Bandiera Moro volunteers, troops composed of the best men in Venice, the brave and able president withstood the besieging and blockading forces of the Austrian Empire from April to August. Famine came to aggravate the sufferings caused by the bombardment, and at the beginning of August cholera showed itself, and eventually capitulation became inevitable. On the 24th Venice surrendered on terms which allowed Manin and his family a safe-conduct out of the Austrian dominions, and on the 27th he quitted for ever the country so dear to him. As a means of subsistence, in addition to a grant bestowed ere his departure by the municipality of Venice, he laboured in Paris as a teacher of the Italian language. Occasionally he wrote in the public press in favour of the Italian cause. He never obtruded himself on public notice, declining even well-meant demonstrations of popular esteem, and died 22nd September, 1857, at Paris.

**MANIPLE**, an ecclesiastical vestment in the nature of a short stole held in the left hand (*manus*), and originally used as a napkin by the celebrant in the mass. It is now worn pendant from the waist and richly decorated.

**MANIPUL** (Lat. *manipulus*, a little handful) was also the name of the original ensign or standard of the Roman legion. It was a handful of hay tied at the end of a pole. Hence the company of about 200 men who followed each standard came to have the name of maniples.

**MAN'NIS**. See PANGOLIN.

**MANITO'BA**, a province of the Dominion of Canada, constituted as such in 1870. It originally formed part of the North-west Territory, most of which, better known as the Hudson Bay Territory, was acquired by the Canadian government in the above year. The North-west Territory occupied the gigantic area of 2,761,310 square miles, and out of this the comparatively small portion of 11,340 square miles was erected into the province of Manitoba, which was further extended in 1881 to the boundaries of 49° N. lat. on the S.; 101° 20' on the W.; 52° 50' N. lat. on the N.; and of Ontario on the E., giving an area of more than 80,000 square miles. Previous to 1870 Manitoba was known under the various titles of the Hudson Bay Territory, the Selkirk Settlement, Red River Country, Assiniboia, &c. Its early history as a home for white settlers dates from 1811-16, between which years the Honourable Thomas Douglas, lord Selkirk, succeeded in planting the first colony within its borders. The next considerable influx was that of a large number of Mennonites from the south of Russia, chiefly around Odessa, in 1871-72. The new military organization adopted by the Russian Empire after 1871 obliged all subjects, without exception, to serve in the army, and the Mennonites had either to conform or seek new homes in some other land within ten years. A colony of Icelanders also arrived in 1875. Since that time, owing to the rapid extension of the Dominion and American system of land and water

communication, its growth in population and trade has been continuous and rapid, and the completion of the Atlantic and Pacific Railway in 1885 has given a further impetus to the development of the province. The population in 1870 was 12,228; in 1881 it had increased to 49,509.

Manitoba is situated on the frontier of the United States, in the middle of the North American continent—nearly equidistant from the pole and the equator, and the Atlantic and Pacific Oceans. The climate embraces extremes of cold and heat. The annual mean is 31° 38', the mean of the three coldest months, December, January, and February, being 6° 85', and the summer mean 67° 76'. Owing, however, to the dry, calm, and bright atmosphere, the winter season is not felt to be so cold as milder winters in climates where the frost is accompanied with dampness. The winters, consequently, are both pleasant and healthy.

The surface of Manitoba—like that of most prairie countries—is for the most part flat or gently undulating, diversified in some parts by groves or clumps of elm, ash, oak, poplar, and other light timber; but seldom pretty, rarely picturesque, and never beautiful. The timber question is an acknowledged difficulty both as regards its use for building purposes and as fuel. Of forests proper to the Canadian standard there are none west of the Lake of the Woods until British Columbia is reached; but trees of various descriptions, affording timber sufficient for most farming and domestic purposes, grow on the banks of the many rivers or are found more or less extensively on the uplands. Railway extension and systematic plantation will no doubt do much to remedy this deficiency in time. The soil is a deep alluvial deposit of unsurpassed richness. It produces bountiful crops of cereals, grasses, roots, and vegetables, but is especially a wheat-growing soil, and contains as favourable conditions for the growth of this grain as any land on the North American continent. The wheat production, indeed, is said to exceed that of the best districts of the United States, the average yield being 30 bushels per acre, of from 63 to 66 lbs. to the bushel. Pumpkins, potatoes, and roots of all sorts grow to perfection. Flax is also very luxuriant. The native grasses of the country are very nutritious, and are particularly favourable for raising stock. Cattle thrive fairly. They can be wintered without grain, but require to be well foddered. Feeble attempts have been made here and there to raise fruit, but without much success. The snow disappears and ploughing commences in April. The crops are harvested in August, as the long sunny days of summer bring vegetation of all sorts to rapid maturity.

Manitoba, in common with the adjacent territories, enjoys facilities for a most extensive system of inland communication. It is magnificently watered by rivers and lakes, which, from their great length and generally uniform depth, afford easy and rapid means of transit and transport throughout its entire extent. The principal rivers are the Red River (of the north), and its tributary the Assiniboine, discharging into the Red River at Winnipeg. The former is 655 miles long, and the latter 480 miles, and is navigable for small steamers for from 250 to 350 miles. The largest lakes are Winnipeg and Manitoba. Lake of the Woods and Winnipegosis are smaller. There is also water communication with Lake Superior to the south-east, and the Canadian Pacific Railway crosses the province rather to the north of the town of Winnipeg.

Rich deposits of iron ore have been found on the slopes of the Rocky Mountains. The gold washings of the North Saskatchewan and Peace rivers afford profitable working. As to coal, the large beds of the North Saskatchewan River, on the Sonis, and in the neighbourhood of the Pembina, Turtle, and Riding Mountains appear practically inexhaustible, it having been ascertained that a belt over

200 miles in width underlies several thousand square miles.

The word Manitoba is a contraction by the French-Canadian voyageurs of the compound Cree word *manito*, spirit, and *waban*, strait. The waters of a strait in the lake (Manitoba) being agitated in an unusual way, the Indians formerly believed that they were moved by a spirit, and so called the lake Manitowaban.

**MAN'NA**, the concrete juice of the "flowering ash" (*Fraxinus ornus*), a species of ash which is a native of the south of Europe, growing abundantly in Sicily, Calabria, Apulia, &c. The juice exudes spontaneously in warm dry weather, and concretes upon the bark of the tree; the finest manna is, however, procured by making longitudinal incisions of about 3 inches long. The manna flows at first in the form of a thick juice, which gradually concretes. The finest kind is called flake manna; it is in pieces of a pale yellowish-white colour, is light, rather dry, and brittle, and it bears frequently the impression of the branch on which it concretes. It has a slight peculiar odour and a sweetish taste, mixed with a slight degree of bitterness, and altogether leaves a disagreeable impression. Although it has a composition not unlike sugar, it is not fermentable. Manna is employed as a gentle laxative for children. It is, however, seldom used, except as an adjunct to more active medicines, as senna, rhubarb, &c. Other kinds of manna are produced by the tamarisk, the allagi, &c.

**MAN'NA CROUP**, or **MAN'NA GROATS**, a preparation made in Russia and elsewhere from the seeds of a grass called *Glyceria fluitans*. It is much used for puddings, and is precisely similar to the Italian semolina.

**MANNHEIM.** See **MANHEIM**.

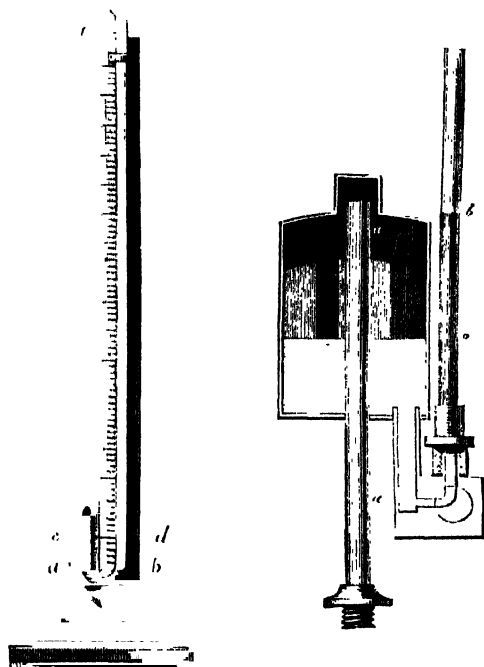
**MANNITE**, a sugar obtained from manna; the saccharine juice of the *Fraxinus ornus*, natural order Oleaceæ. It exists ready formed in many fungi, and in several plants and ferns. It is also found as an efflorescence on some of the algæ, in which it is a product of fermentation. It is usually formed during fermentations of starch and sugar, and especially in that known as the viscous fermentation. It is easily prepared from manna by boiling it in alcohol; the mannite crystallizes out in four-sided prisms, which may be obtained of great size and purity. The formula is  $C_6H_{14}O_6$ . It is very soluble in water and alcohol, but insoluble in ether. It differs from other sugars in being unfermentable, and has no action on polarized light. It melts at  $165^{\circ} \text{C}$ . ( $329^{\circ} \text{Fahr.}$ ), boils at  $200^{\circ} \text{C}$ . ( $392^{\circ} \text{Fahr.}$ ), and distils without decomposition. It is a hexatomic alcohol. Mannide ( $C_6H_{10}O_4$ ) and mannitan ( $C_6H_{12}O_4$ ) are syrupy bodies derived from mannite by the elimination of the elements of water. Nitro-mannite,  $C_6H_7(NO_3)_6$ , is a very explosive compound; it forms white crystals soluble in alcohol and ether, but insoluble in water. Mannitic acid ( $C_6H_8O_7$ ) is an uncrystallizable acid obtained from mannite by oxidation. It forms uncrystallizable salts called mannitates. Another product of the oxidation is mannitoic ( $C_6H_8O_8$ ), another variety of sugar.

**MANOMETER** (from two Greek words signifying thin or rare and a measure) is the name given to instruments (more often called pressure gauges) which measure the elastic force exerted on the walls of a closed space by the atmosphere or other gases. The elastic force is generally measured in atmospheres; that is, in multiples of the average pressure of the atmosphere on a square inch. This is found to be nearly 30 inches of mercury, which at the standard temperature measures 14.7, nearly 15 lbs. An atmosphere is usually taken, then, as 15 lbs. to the square inch.

**Open-air Manometer.**—When low pressures are sought to be measured (not above four or five atmospheres) this is a useful instrument. It is simply a bent tube, open at both ends, containing a small quantity of mercury. The mercury rises as it will in the longer arm, and this is taken as

1 (the pressure of one atmosphere); from the point 1 the scale is graduated 2, 3, 4, &c., at intervals of 30 inches, and each atmosphere is divided into tenths and hundredths. Beyond the mercury (*a b* in the figure) is the short arm, *c*; the tube ends above *c* in such a way as to be readily connected with the gas, &c., to be measured. The pressure of the gas upon the surface, *a*, will of course force the mercury up in the long arm of the tube, *d*, according to its intensity. The limit to this simple instrument is the length of the longer arm, which becomes excessive after four atmospheres or so. M. Amagat, however, availing himself of the shaft of a coal-mine near St. Etienne, worked in 1880 with an open-air manometer nearly 400 yards high.

**Compressed-air Manometer.**—This is founded on Boyle's law, that "at a constant temperature the volume of a gas is in inverse ratio to its pressure." Thus, by doubling the pressure on a volume of gas you halve its bulk. An air-



Open-air Manometer.

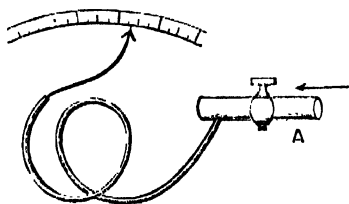
Compressed-air Manometer.

tight closed chamber is provided in which is a quantity of mercury, as shown in the illustration. Connected with this chamber there is a tube, *b*, which dips into the mercury and is accurately fitted so as not to disturb the perfect closure of the air-tight chamber. It is graduated from its point of issue, and is closed at the top. Through the bottom of the chamber, and penetrating the mercury, rises a second tube, *a*. The latter will of course admit air, and the air pressing on the surface of the mercury in the chamber forces the metal up the graduated tube *b* till, at *a*, it balances the pressure of the atmosphere. This marks the point 1. It is manifest that if the apparatus be now fixed on to a boiler, steam chest, &c., so that the vapour whose force is to be measured passes into the chamber, the force exerted on the surface of the mercury will vary from that of the atmosphere. The mercury will be forced up the graduated tube till the pressure of the compressed air existing in that tube above the mercury, and held there because the tube is closed at the top, equals the pressure of the vapour being measured. The heavier the pressure the more elastic becomes the compressed air, and the smaller



the graduations. Roughly speaking, doubling the pressure halves the volume of the compressed air beyond the mercury. The graduation is usually effected by absolute trial, as Boyle's law is found not to be exactly accurate. The manometer is now largely used by physiologists for determining the arterial pressure of the blood-flow in the circulation, the pressure of the air in the lungs, the force of respiration, &c.

**Metallic Manometer.**—For very high pressures glass tubes become dangerously brittle, and further, they get coated by the mercury in course of time; pressure gauges composed entirely of metal have therefore been constructed. One of the best of these is Bourdon's gauge, of which we



Bourdon's Metallic Pressure Gauge.

give an illustration. The gas or vapour, being admitted at A, passes down a narrow curved copper tube of elliptical bore, and the greater its pressure the more does it tend to straighten the tube, to uncurl it, in fact; consequently the more to the left is the needle deflected. The scale is graduated very carefully in atmospheres and fractions of atmospheres.

**MANOMETRIC FLAMES.** Sound reaches the ear, as is well known, by vibrations of the air. [See ACOUSTICS.] Many devices have been invented to render these vibrations visible by their effects. The best of them is the manometric flame of Koenig the acoustician. To a resonator or chamber for reinforcing a tone of a certain pitch [see RESONATOR] is fixed a gas-chamber, often of



the shape of a small flat box big enough to hold two half-crowns laid flat on one another. This is closed on the side next the resonator by a thin membrane of india-rubber. Gas is conveyed from a source of supply to the gas chamber by one pipe, and from it by another pipe, this last carrying a fine jet, so that the issuing gas may be set

alight. The appropriate sound being given, the air within the resonator is thrown into strong vibration, the india-rubber membrane is set into pulsating motion, and by consequence the flame at the gas-jet flickers. To see the form of the flicker the flame should be viewed in a rotating mirror, so that if it were steady it would show a band of light, but when it flickers it shows a series of tongues not unlike the teeth of a saw. The experiment is thus made visible to a large audience at once. The above illustrations show the effect on the flame of the fundamental tone of the resonator, its octave, and a combination of the two. Other intervals give more complex and sometimes infinitely involved and lovely forms.

**MAN'OR** (*manerium*). At the time of the Norman Conquest *manerius* or *manerium* (from Lat. *maneri*, to dwell) denoted a large mansion or dwelling. The modern English manor derives its origin from subinfeudation, as it existed before the modifications of the system of tenures introduced in 1225 by a reissue of Magna Carta, and the still more important alterations made in 1290 by the statute Quia Emptores, and in 1321 by the statute De Prærogativa Regis, by which statutes the granting land in fee simple, to be held by the grantee as a tenant or vassal to the grantor, was stopped. A manor *originally* consisted of lands in demesne, upon which the lord had a mansion, and to which lands and mansion, and more especially to the mansion, there was appendant a seigniorial over freeholders qualified in respect of quantity of estate (*i.e.* by a tenancy for life at the least, if not a tenancy in fee-simple), and sufficient in point of number, to constitute a court-baron. These freeholders were called *vasallus*, and their lands "tenemental lands," *i.e.* lands granted out in tenure, to distinguish them from the lord's demesnes. These tenemental lands, anciently known by the denomination of *vasallus*, though held of the manor and within the seigniorial (or, as it was usually termed, within the fee) of the lord, were not considered as part of the manor; but the services issuing from such tenemental lands were part of the manor, and essential to its existence. Afterwards it was sufficient if the site of a mansion, at which the services had been reserved, formed part of the demesnes; and at last this vestige of the origin of the name of the estate was dispensed with, and if the lord retained any portion of the land, so that there would be some demesnes to which the seigniorial over the freehold tenants of the manor, and the services rendered by them, might continue to be appendant, the compound estate called a manor was not dissolved, whether it could be shown that a mansion had ever stood on the part of the demesnes or lands retained or not, and even if the lord had aliened and severed from his demesnes the spot on which the mansion had once stood.

**MANS, LE**, the capital formerly of the province of Maine, now of the department of Sarthe, in France, stands on the right bank of the Sarthe, here crossed by three bridges and a railway bridge. It is 132 miles S.W. from Paris by rail, and had 51,111 inhabitants in 1886. The Cathedral of St. Julien, famous for its choir and painted windows, and dating from the thirteenth century, contain the tomb of Berengaria, Capet-de-Lion's queen. The Church de la Couture, which dates from the twelfth century, and that of Notre Dame-du-Pré, from the eleventh century, are very remarkable buildings. Le Mans is partly inclosed by Roman walls. It has a town-hall, prefecture, theatre, two hospitals, museum, communal college, and a public library of 50,000 volumes. It gives title to a bishop. The manufactures consist of coarse woollen, lace, honey, wax candles, linens, soap, hosiery, blankets, woollen yarn, paper, and leather. There are also marble works, a tobacco factory, and bleach mills. The town is noted for its poultry, of which it sends a large supply to the metropolis.

The town is an important railway junction, and in con-

sequence became for a time the central position of the French army of the Loire during the Franco-German War of 1870-71. It was the scene of some severe fighting on 10th and 11th January, 1871, between the troops of General Chanzy and those of Prince Frederick Charles and the Grand-duke of Mecklenburg, in which the former were completely defeated and 20,000 of them made prisoners. The town was evacuated by the French on the 12th, and remained in possession of the Germans until the close of the war.

**MANCARD, FRANÇOIS**, was born at Paris in 1598. At the age of twenty-two he distinguished himself as an architect, but none of his works are in a pure style of architecture. He died in 1666. He is said to have been the inventor of the eub roof, characteristic of the Renaissance and now with modifications common in Paris, called after him a *Mansard*, which consists of two planes on each side, a steeper one below and a flatter one above, so that it admits of an attic being lodged in it. Mansard roofs are rapidly increasing in England, as they not only make the roof useful but highly ornamental as a termination to the building, giving it an imposing and varied sky line.

**MANCARD, JULES HARDOTIN**, a nephew of the preceding, born in 1645. He was the architect of Versailles and of the dome of the Church of the Invalides at Paris. He died in 1768.

**MANSE**, in Scottish law, originally meant a determinate quantity of ground, the extent of which is not known, fit either for pasture or tillage, set apart for the use of the clergyman of every rural parish. The term is now applied to the dwelling-house, including stable, byre, barn, and other offices to which he is entitled by law; the portion of land with which he is also provided being called his glebe. Ministers of parishes within the bounds of royal burghs are not entitled to manse; but where the parish is partly rural and partly burgh-royal the heritors are bound to provide him with a manse. The burden of erecting and supporting the manse lies upon the heritors who are the proprietors of lands within the parish. On the completion of the building the heritors may apply to the presbytery of the parish, who upon visitation will pronounce the manse a free manse, the effect of which is to oblige the minister to keep the manse in tenantable condition during his incumbency. When a manse stands in need of additions and repairs, or when a new manse is required, the minister may petition the presbytery to have the same examined; and after consideration of plan and estimates, the presbytery will grant decree against the heritors for the sum necessary for the required alterations. Over and above their proper stipend clergymen of rural parishes are entitled to 4 acres of arable land in name of glebe, and to grass for a horse and two cows as grass glebe.

**MANSEL, HENRY LONGUEVILLE, D.D.**, a celebrated modern metaphysician, was born at Cosgrove, Northamptonshire, 6th October, 1820. He was educated at Merchant Taylors' School and St. John's College, Oxford, becoming a scholar and fellow of the latter in 1842, and in 1843 he took a double first. He was afterwards ordained and appointed a tutor of the college. In 1855 he was appointed reader in moral and metaphysical philosophy at Magdalen College; in 1859 Waynflete professor of logic; regius professor of ecclesiastical history in 1867, as successor to Dean Stanley; and in 1868 dean of St. Paul's. He died at Cosgrove Hall, 31st July, 1871.

Devoting himself especially to logic and metaphysics he published in 1849 an edition of Aldrich's "*Artis Logice Rudimenta*," in 1851 "*Prolegomena Logica, an Inquiry into the Psychological Character of Logical Processes*," and in 1855 a work entitled "*The Limits of Demonstrative Science Considered*." Conjointly with Professor Veitch he edited the lectures of Hamilton, and in 1866 published an essay on the "*Philosophy of the Conditioned*," in reply to J. S. Mill's criticism of Hamilton. The work of Man-

sel's which excited the greatest interest, however, was his Bampton Lectures of 1858 on the "*Limits of Religious Thought*," which awakened a keen and interesting controversy, in which Professor Maurice took an important part. Designed by Mansel as a defence of revealed theology, his theory was denounced by some of his critics as amounting to "virtual atheism." A posthumous work, consisting of lectures on "*The Gnostic Heresies*," was published with a memoir in 1875.

**MANSFIELD**, a market-town of England, in the county of and 13 miles N. by W. from Nottingham and 110 miles from London by the Midland Railway, is situated in a valley near the little river Mann or Maun, and is surrounded by the district known as Sherwood Forest. It contains a town-hall, mechanics' institute, a commodious parish church, a free grammar school, and a union work-house. The principal manufactures are those of thread, stockings, silk and cotton gloves, lace, and mustard. There are also some iron-foundries and an extensive trade in malt. The neighbouring quarries supply an excellent stone for the purpose of architectural ornament. The population in 1881 was 13,563.

About 1½ mile from Mansfield is the village and township of Mansfield-Woodhouse, near which are some curious remains of two Roman villas.

**MANSLAUGHTER**, in English law, is the unlawful taking of human life without malice express or implied. It may be either voluntary or involuntary, but it implies that the act was done without premeditation. Thus if in a quarrel a man strikes his opponent with his hand and so causes his death, the act would generally be regarded as manslaughter, but the use of a weapon, such as a knife or pistol, would very possibly be held to imply premeditation, which would make the crime murder. Manslaughter may be committed involuntarily through culpable carelessness or neglect, and it is in this sense that the term is generally interpreted in Scotland. See HOMICIDE.

**MANTEGNA, ANDREA**, was born at Padua in 1431. His parents were in humble life. His chief residence and his school were at Mantua, under Gonzaga, but he worked occasionally at other places, especially at Rome. "*The Triumph of Julius Caesar*" was purchased by King Charles I. from the Gonzaga family. This, his greatest and most esteemed work, consisting of nine tempera pictures, each 9 feet high and 9 feet wide, is now at Hampton Court. Unhappily it was coarsely painted over by Laguerre, in the time of William III. Mantegna was undoubtedly the greatest painter of the north of Italy in the fifteenth century, and he was the first to engrave his own designs. There are some fine works by him in the National Gallery. He was the son-in-law of Jacopo (the elder) Bellini, and through him and his brothers-in-law exercised great influence upon the rise of Venetian art. He died at Mantua on the 13th of September, 1506.

**MANTES**, a town of France, in the department Seine-et-Oise. It is a first-class station on the Paris-Rouen Railway, 34 miles W.N.W. from Paris, on the left bank of the Seine, which an island here divides into two branches, crossed by handsome bridges, that connect the town with the suburb of Limay, on the right bank of the river. The town, which is well built and adorned with several fountains, has a public library, a civil tribunal, three hospitals, an almshouse, several tanyards, breweries, flour-mills, and a saltpetre factory. It has a fine Gothic church, with two lofty towers; and from its delightful situation is styled "*La Jolie*." The town and its monasteries were pillaged and burnt by William the Conqueror in 1096; his horse reared in treading on the burning embers concealed by a heap of ashes, and in recovering himself he was thrown forward on the pommel of the saddle and so much injured that he died in Rouen a few days after. The population in 1886 was 6419.

**MANTINEIA** was situated in the east part of Arcadia, in an elevated plain of considerable extent, which was bounded on the north by the plain of Orchomenos, and on the south by that of Tegea. The Mantineans had a democratical form of government, and were closely connected with Argos.

In B.C. 385, after many and long-continued wars, the Spartans took Mantinea and destroyed the city. After the battle of Leuktra the Mantineans rebuilt their city, and it was in the vicinity of their town that the battle was fought (B.C. 362) between the Spartans and Thebans, in which Epaminondas fell. Mantinea, in later times, joined the Achaean League. Pausanias, who visited this city in the second century, describes it as a large and flourishing place, and has devoted a considerable part of his eighth book to a description of its works of art. The ruins of Mantinea, now called *Paleopoli*, are still considerable. The walls are nearly entire.

**MAN'TIS** is a genus of insects belonging to the order ORTHOPTERA and family Mantidae. These insects are found in all warm countries, are exceedingly numerous, and remarkable for the grotesque forms which they usually assume. Their resemblance to a portion of a plant is often so great, that it is only by their motions they can be discovered. A Japanese mantis so exactly resembles a pink orchid that insects are attracted into its very jaws in search of honey. Another tropical species presents a close resemblance to the white ants on which it feeds.

A number of legends have clustered round the mantis on account of a peculiarity in its structure. The prothorax is greatly elongated, and is usually bent at an

angle with the body, and carried in a semi-erect position. The first pair of legs are converted into powerful weapons of offence. The *coxa* or basal joint is much elongated, while the *femur* or thigh is very long, and has on its under surface a deep groove, the edges of which are furnished with strong spines. The *tibia*, the joint which follows, is also armed with spines, and can be bent back like the blade of a penknife on the femur. The curious attitude of the mantis as it stalks slowly along or remains motionless on the watch for prey, has led to its being credited with a sanctity to which it certainly has no claim, as the various names, soothsayer (*Gr. mantis*), preacher, saint, &c., attest. In the south of France it was held that it would point out the way to a lost child. According to another legend, a mantis having alighted on the hand of St. Francis Xavier, was desired by him to sing the praises of God; with which request it immediately replied by intoning a beautiful canticle.

The Mantidae feed on flies, grasshoppers, and other

insects, and one species, *Mantis argentina*, of Buenos Ayres, seizes and eats small birds. Their formidable fore limbs are also used in fighting among themselves, and the females sometimes devour the males.

In the Mantidae the body is elongated, the antennae thread-like, the wings well developed with the veins showing a fan-like arrangement.

The eggs are deposited by the female mantis upon plants, where they are arranged in a symmetrical manner, are covered by a glutinous substance, which soon hardens into a kind of case. The form of the case varies according to the species. The young when hatched resemble the parents, except in size and in being destitute of wings.

The Mantidae are most abundant in the tropical parts of the world, especially in South America, but a few are found in the south of Europe and North America. *Mantis religiosa* (the common praying mantis) is common in the South of France: it is about 2 inches in length, with simple thread-like antennae. The species of genus *Eremophila*, inhabiting the deserts of North Africa, resemble the sand in colour.

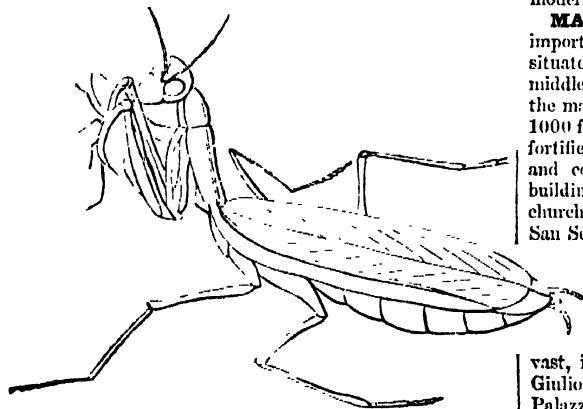
**MAN'TLET**, a temporary fortification to protect gunners from the bullets of the enemy. It is made so that it may be hoisted while aim is being taken, and then lowered so as to cover the whole opening in the embrasure, casemate, or port-hole, except a small aperture for the muzzle of the gun. They are generally made of solid planks of wood or iron plates; but during the Crimean War the Russians constructed some very skilful ones of plaited rope. Mantlets have become more used than ever of late years, in consequence of the precision and length of range of the modern rifles.

**MAN'TUA** or **MAN'TOVA**, a city of great historic importance in Northern Italy, 22 miles S.S.W. of Verona, situated on an island about 5 miles in circumference, in the middle of a lagoon formed by the Mincio, and joined to the mainland by causeways, the shortest of which is about 1000 feet in length. The town is regularly and very strongly fortified. It is well built, with wide streets and squares, and contains many handsome structures. The principal buildings are—the cathedral, one of the finest in Italy; the church of Sant Andrea; the churches of San Maurizio and San Sebastiano; the house of Giulio Romano, whose works as a painter and an architect form the greatest glory of the city; the Church of Santa Barbara, rich in paintings; the public library of 80,000 volumes, and the museum, in which is a valuable sculpture gallery; the ducal palace, an old,

vast, irregular structure, partly rebuilt and decorated by Giulio Romano, which contains some good paintings; the Palazzo Vecchio, in which Napoleon I. held his court; several convents, a Jews' synagogue, civil hospital, two orphan and one Jews' asylum; arsenal, cavalry barracks, theatre, sculpture gallery, and the gates and bridges of the town, especially the gate dei Mulini, by Giulio Romano. A palace outside of the town, called Palazzo del Tè, was originally intended for stables for the Gonzaga dukes, but under the direction of Giulio Romano it grew into a vast palace. There is a good fresco there. The town of Mantua contained 29,974 inhabitants in 1882, of whom about 2500 are Jews.

Mantua has a lyceum, gymnasium, academy of fine arts, several scientific and literary institutions, botanic garden, and numerous collections in science and art. From its situation the place is extremely unhealthy. The manufactures comprise silk, linen, and woollen fabrics, paper, cordage, leather, and parchment. Virgil was born at Andes, (now Pietole), 3 miles S.E. of this city.

After the conquest of Italy by Charlemagne in the eighth century, Mantua became the capital of a republic. It then came into the possession of the Gonzaga dukes, to whom it belonged till it fell to Austria in 1708. It was taken



Mantis.

angle with the body, and carried in a semi-erect position. The first pair of legs are converted into powerful weapons of offence. The *coxa* or basal joint is much elongated, while the *femur* or thigh is very long, and has on its under surface a deep groove, the edges of which are furnished with strong spines. The *tibia*, the joint which follows, is also armed with spines, and can be bent back like the blade of a penknife on the femur. The curious attitude of the mantis as it stalks slowly along or remains motionless on the watch for prey, has led to its being credited with a sanctity to which it certainly has no claim, as the various names, soothsayer (*Gr. mantis*), preacher, saint, &c., attest. In the south of France it was held that it would point out the way to a lost child. According to another legend, a mantis having alighted on the hand of St. Francis Xavier, was desired by him to sing the praises of God; with which request it immediately replied by intoning a beautiful canticle.

by Napoleon I. in 1797, and was the capital of the French department of the Mincio till 1814, when it again came into the possession of Austria. Most of the province was annexed to Italy after the war between France and Austria in 1859, and the city was incorporated with Italy in 1866.

**MANUMISSION** was the form by which a Roman slave was freed from slavery. He might be registered in the census as a burgess with his master's consent; or secondly, he might receive his liberty as a legacy by will; or finally, he might be manumitted by "vindicta." The master brought his slave before one of the chief magistrates, stated the cause of manumission, and held the slave while the licitor of the court pronounced the "vindicta," when he let him go from his hand (*e manu missi*), whence the name of the ceremony. After manumission the parties were no longer master and slave, but patron and freedman. The freedman took the name and gentle name of his patron, usually adding some name of his own choice as a cognomen. Thus the well-known Tiro, freedman of M. Tullius Cicero, took on his manumission the names of M. Tullius Tiro. The ceremonies done, the slave put on the pileus, donned the toga, placed a signet-ring on his finger, and went to get shaved—the distinctive marks of a free man.

**MANURE.** This word is simply a shortened form of *main euvre*, handiwork, that is, the work of digging and fertilizing land. Thus Bacon in his "History of Henry VII." speaks of "arable land which could not be manured (tilled) without people and families" as being necessarily turned into pasture. Hence the word came to be used for other fertilizing agencies, and finally for these alone. Under this name we include every substance used to amend the soil, or to restore to it some particular principle or ingredient which has been exhausted in the course of cultivation. According to their respective modes of action, manures may be divided into mechanical and chemical, though several rank at once under both heads. A mechanical manure or "amender" serves merely to improve the texture of the soil, so as to render it more compact or, if needful, more permeable to moisture, air, and the root-fibres of plants. Thus sand or ashes added to a stiff clay, and clay or marl mixed with a soil of loose sand or of peat, are instances of mechanical manures. Their value when judiciously applied is extremely great, since, no matter what may be the chemical constitution of the soil, it cannot be fruitful if so light as to allow moisture to escape too rapidly, and permit the roots of plants to be loosened by the wind; or if, on the other hand, it is so dense as to allow water to stagnate in its texture. When a soil is in fine mechanical condition it will not cake together after being wet, and when dried will rapidly gain weight by condensing watery vapour and gases in its pores.

Chemical manures supply to the soil some necessary ingredient or ingredients either naturally wanting, or which may have been removed by the crops cultivated. The bulk of the organic structure of plants is composed of the elements oxygen, hydrogen, nitrogen, and carbon, which, in the several combinations of carbonic acid, water, and ammonia, are drawn from the atmosphere and the soil. But even when these are applied to vegetables their growth will not proceed unless certain mineral substances are likewise furnished in small quantities either by the soil or the water used to moisten it. The great majority of plants when burned leave ashes, which commonly contain silica, potassa, and phosphate of lime; often, also, magnesia, soda, sulphates, and oxide of iron. These mineral bodies are essential to the existence of vegetable tissues, and plants will not grow in soils destitute of them, however abundantly supplied with carbonic acid, ammonia, and water. The carbon of plants is wholly derived from carbonic acid, which is either absorbed from the atmosphere and from rain-water by the leaves, or from the moisture and air in the soil by the roots. The carbonic acid always present in the air is eagerly

absorbed by the leaves of plants, the carbon being retained and assimilated with the body of the plant, while its oxygen is given out in the gaseous form; this decomposition being always effected under the influence of light at ordinary temperatures. Water is so common an article that in the general way nature provides all that plants require, and the hydrogen and oxygen of which they are partly composed are derived from the water chiefly absorbed by the roots from the soil. The nitrogen of plants is derived chiefly, if not exclusively, from ammonia, which is found only in very minute quantities in the atmosphere and in rain or river water, and this, when exhausted from the soil, must be supplied by manures.

The importance of the mineral elements in the healthy and vigorous growth of plants has been fully established by the researches of Liebig, Polstorff, and others; but more recent experiments have shown that the celebrated "mineral theory" of agriculture propounded by Liebig cannot be accepted without important modifications. According to this theory a soil is fertile or barren for any given plant according as it contains those mineral substances that enter into its composition. Thus, "the ashes of wheat-straw contain much silica and potassa, while the ashes of the seeds contain phosphate of magnesia. Hence, if a soil is deficient in any of these it will not yield wheat. On the other hand, a good crop of wheat will exhaust the soil of these substances, and it will not yield a second crop till they have been restored either by manure or by the gradual action of the weather in disintegrating the subsoil." The professor, in summing up the results of his experiments, draws from them the following conclusions:—(1) By examining the ashes of a thriving plant we discover the mineral ingredients which must exist in a soil to render it fertile for that plant; (2) by examining a soil we can say at once whether it is fertile in regard to any plants the ashes of which have been examined; (3) when the defects of a soil are known the deficient matters may be obtained and added unmixed with such as are not required; (4) the straw, leaves, &c., of any plant are the best manure for that plant, since every vegetable extracts from the soil such matters alone as are essential to it, and when these are used in the proper quantity no other manure is required. He also declared that "the crops on a field diminish or increase in exact proportion to the diminution or increase of the mineral substances conveyed to it in manure." The prolonged and elaborate experiments, however, which have been carried out by Messrs. Lawes and Gilbert at Rothamsted appear to prove that it is impossible to get good crops by using mineral manures alone, and that nitrogenous manures (farmyard manures, guano, ammoniacal salts, &c.) are fertilizing agents of the highest value.

Among manures the first place belongs for many reasons to the excreta of animals kept on the farms, together with the straw used as a litter, and "farmyard manure" has been chemically proved to contain, without exception, all the constituents which are required by cultivated crops to bring them to perfection. Fresh dung, from its being soluble in water only to a limited extent, is more slow in its action upon vegetation than dung which has been allowed to ferment and become thoroughly rotten, but where it is collected in heaps care must be taken to prevent the fertilizing matter being washed away by the rain. A pit having impervious sides and bottom is the best place for keeping manure, and the bottom should be so constructed that the liquid which runs off may be collected and again poured over the heap. Farmyard manure may be enhanced in value by proper regard to the feeding of the animals kept, and, in addition to the fertilizing matter it contains, it helps also to keep the land open and porous, and thus exercises a beneficial mechanical influence. Its chief defect is the large amount of water it contains, which amounts to about two-thirds of its weight, so that when

it has to be conveyed any great distance there is the expense of conveying much useless matter. The most powerful natural manure known is GUANO, already described in the article on that subject. The mixtures known as superphosphates are also of great importance. They are prepared chiefly from bones, coprolites, phosphorite, apatite, &c., the materials being treated with sulphuric acid, and they derive their value chiefly from the soluble biphosphate of lime they contain, along with neutral phosphate in a fine state of division. Excellent manures are also prepared from blood, refuse fish, glue-makers' waste, hair, horn-shavings, and leather scraps, rendered soluble by means of sulphuric or hydrochloric acid. The crude sulphate of ammonia and the nitrate of soda are valuable sources of nitrogen, as are also, in a lower degree, oil-cake and soot. Night soil is a more powerful manure than dung, and as prepared and dried in France, under the name of *poudrette*, it has about ten times the value of ordinary farmyard manure. The sewage of towns contains a vast quantity of fertilizing matter, such as urine, soap-suds, and many other kinds of refuse, domestic and manufacturing, but the whole is so largely diluted with water that its agricultural application is yet an unsolved problem, except where lands lie below a town in a situation adapted for irrigation. Sea-weeds form a useful manure for many crops, especially flax and hemp, one load of seaweed being considered equivalent to about four of farmyard manure. Charcoal, whether of bones, wood, or peat, is a valuable addition to manures on account of its property of absorbing and retaining in its pores gases and vapours. Unburned peat possesses a similar property, and where accessible is a valuable manure for sandy and calcareous soils, to which it imparts an increased power of retaining moisture. Ashes are often useful, and those of wood, peat, and weeds yield a considerable amount of the salts of potash. Lime acts in various ways, yielding direct nourishment to vegetation, and promoting the decomposition of organic matter; it also liberates silica from some of its combinations and renders insoluble any salts of iron. Where a soil is deficient in lime farmyard manure, guano, &c., may be liberally supplied and yet fail to produce their proper effect, while on poor sandy soils a supply of lime will frequently give better results than a more expensive supply of farmyard manure.

Manures, like the food and medicines given to animals, require to be administered with judgment. Those intended to ameliorate the texture of the soil and effect any kind of decomposition in its ingredients should be added a considerable time before the ground is planted, in order that they may have full scope to perform their function. Rich nitrogenous manures, especially if volatile, should be given only when moisture is plentiful, and when a vigorous vegetation can at once appropriate the nourishment placed at its disposal. To dress the land with guano, sulphate of ammonia, or soot, in dry windy weather is utter folly. The richer manures, when administered to growing crops, are best given in a state of solution. They are thus presented at once in an available form to the fibrils of the roots, and are secured against lying useless upon the soil. In no other method can grass lands be so efficiently top-dressed. It must, however, be admitted that the use of liquid manures is better adapted to a dry climate than to Britain, where in ordinary seasons the amount of rain bears an excessive proportion to the temperature. It is a matter of national reproach that even in the present day an immense quantity of the elements of fertility are allowed to go to waste, and even to become nuisances, while at the same time the country is spending about £3,500,000 per annum for foreign manures. Steps have, however, of late years been taken in the right direction, and though many difficulties have been discovered there is no reason to doubt of the ultimate success of the experiments that have been made. See SEWAGE, UTILIZATION OF.

**MANUSCRIPTS** (Lat. *manu scriptus*, hand-written), literally, writings of any kind and on any material, but generally restricted, in a literary sense, to the books written before the introduction of the art of printing. Large numbers of these manuscript books are preserved in the libraries of Europe, and the reading, dating, and proper use of these form a distinct branch of study known as the science of diplomatics. Most of the manuscripts preserved in Europe have been examined by competent scholars, and their contents, when sufficiently valuable, made known to the world; but there is still room for more thorough and careful work in this direction, and there can be no question as to the necessity for insuring the contents of all valuable MSS. from being lost, by the multiplication of copies through the printing press or otherwise. In the earliest times men wrote upon tablets of wood, of brick or stone, upon the bark and dried leaves of trees, and upon thin plates of metal. Then came the use of skins and the invention of paper from the papyrus reed of Egypt. Paper from cotton or silk was invented in the early part of the eighth century A.D., and paper from linen about the thirteenth or fourteenth century. All the western MSS. extant are written upon parchment or paper, and the former have proved to be of very great durability. Many of the manuscripts that have been preserved bear subscriptions stating by whom and when they were written, but there are others which have no such mark for the determination of their antiquity. Even where these subscriptions are found they cannot be trusted implicitly, as later copyists frequently copied such notices from the originals before them, and there are many such subscriptions which are palpable forgeries. The external characteristics, however, are of less importance in judging the date of a manuscript than the peculiarities of the handwriting, the mode of forming the letters, the use of abbreviations, &c., which suggest important tests of age. The oldest European manuscripts known are specimens of Greek writing found among the ruins of Herculaneum and Pompeii. In these the writing runs across the volume in large letters, without any division of words or sentences, without accents or ornaments, and with but very few pause marks. This method of writing continued in common use for several centuries after the date of the destruction of these cities, 79 A.D.; but some alterations were introduced by Euthalius in his editions of the books of the New Testament, in the latter half of the fifth century. In the seventh century the letters began to be compressed and inclined, and further changes were gradually introduced until in the tenth century the cursive style of writing had nearly superseded the uncial. By the careful comparison of large numbers of manuscripts a series of rules have been drawn up by which the age of any book can be determined with a very fair degree of accuracy. See also BOOK and ILLUMINATING.

**MANUZIO, ALDO** (shortened form of *Tobaldo*), or in the Latinized form, *Aldus Manutius* (1449-1515), was a famous Venetian printer. He invented the type called *italic*, and was very fond of it. The small volumes of the Aldine publications are almost priceless. Paolo Manuzio succeeded to the famous press in 1533, and added to it a professorship of eloquence about 1558. He went to Rome about 1561. Aldo Manuzio, the younger (1517-97), was not only a printer, but an author and professor of belles lettres at Bologna, 1585, and Rome, 1589. He also became director of the Vatican press, 1590. See **ALDINE**.

**MANYUEMA COUNTRY**, a large district in Central Africa visited by Dr. Livingstone, the chief town of which, Bambarre, lies 140 miles W. of the northern part of Lake Tanganyika, in about 2° 7' 10" E. lon. Dr. Livingstone was detained here several months in 1869-70, through sickness and other causes, and his last "Journals" (London, 1873) contain much interesting information as to the people and their country. The latter is described as "sur-

passingly beautiful," "excessively fertile," and is largely cultivated, but is also very unhealthy. Immense forests abound—hence the name of *Manguima*, or "forest people." It was here the doctor found the superior race of intelligent and industrious Africans, said to be fully equal, in handsome physical form of the men and beauty of the women, to any white race. There is no national life, every petty headman being supreme in his own village. Between these numerous settlements feuds are common, human life is taken on the most trifling pretext, and the people were suspected, not without reason, of cannibalism.

**MANZONI, ALESSANDRO FRANCESCO TOMMASO ANTONIO**, an illustrious Italian author, was born at Milan, 7th March, 1785. His father was a descendant of a noble Italian family, and his mother a daughter of the celebrated Beccaria. At the age of twenty-one Manzoni went to Paris, where his mother had been a resident for some years. Here he made the acquaintance of several well-known literary men, and embraced the current sceptical opinions. In 1806-7 he published a short mythological poem entitled "Urania" in the classical style, and an elegy in blank verse on the death of Count Carlo Imbonati. In 1808 he married and retired to an estate near Milan, dividing his time thenceforth between husbandry and literary work. Through the influence of his wife he renounced scepticism and became a devout Catholic, and his next publications consisted of a series of "Sacred Hymns" and a prose work on Catholic morality. In 1819 he published a tragedy, "Il Conte di Carmagnola," in which he abandoned the old traditions of dramatic writing with so much thoroughness and success as to place himself at the head of the romantic school of Europe. In 1821 the death of Napoleon inspired him to compose an ode entitled "Il Cinque Maggio" (the Fifth of May), which has been said to be the most popular lyric in the Italian language. His greatest triumph, however, was attained when, in 1825, he published the first volume of a historical novel entitled "I Promessi Sposi" (the Betrothed), a Milanese story of the seventeenth century. In this work, which was completed in 1827, the influence of Sir Walter Scott is plainly traceable. Its incidents are well told, the characters carefully developed, and the awful scenes attendant upon the plague and famine in Milan are described in the most vivid and impressive manner. Scott pronounced it to be the finest novel ever written, and it has certainly proved to be one of the most popular, for since its publication in 1825-27 it has gone through 118 Italian, nineteen French, seventeen German, and ten English editions. Manzoni added, in 1842, to an illustrated edition of this novel "La Storia della Colonna Infame" (the History of the Column of Infamy), in which he gives a striking picture of the atrocious executions, the consequence of superstition, during the plague of 1630. Beyond this, however, and an occasional pamphlet, he wrote nothing after the publication of his famous novel. In 1860 he was nominated an Italian senator, and he died 22nd May, 1873. In his private life he was irreproachable, and by his affection, benevolence, and unvarying courtesy he gained for himself the enthusiastic love of a large circle of friends. Several biographical sketches, written by his literary friends, have appeared in Italy since his death, and some of his letters have been published by Giovanni Sforza.

**MA'ORIS** or **MAORIES**, the aboriginal inhabitants of New Zealand. The name is derived from a native word signifying "native" or "indigenous," and was first used by themselves. They belong to the Malay race, and have a tradition that their progenitors migrated from the island of Hawaiki, supposed to be the modern Hawaii, in the fourteenth century of our era. But as this island is 4000 miles distant from New Zealand, and the canoes which they used must have been of a rude description, some persons have thought that the tradition alludes to Savaii, one of the Navigators'

Islands, a much nearer group. Although the native tradition makes no mention of any previous inhabitants in New Zealand, it is generally believed that the original natives were a darker race, similar to the Papuas of New Guinea, and that in process of time the two races intermingled.

The Maoris are altogether different from the aborigines of the Australian continent, being a fine, well-formed, tall, and muscular people, with a complexion which varies in shade from an olive or copper-coloured hue to a dark brown. Their countenances, especially those of the higher orders, are often very pleasing, and nearly always striking, animated, and intelligent; their hair glossy, black, and curling; and their general cast of features not materially different from the European standard. Few of them have beards or whiskers, as a very old custom exists among them of plucking out the hair on their face with shells. The women are of less stature, and altogether inferior to the men. They marry early, and perform a large amount of field labour, and thus become bent and old at forty.

The New Zealanders possess many qualities superior to those of savage nations in general. They have considerable forethought and vigour of mind, and are hospitable, frank, generous, and keenly sensitive upon points of honour. They have, however, some of the savage vices; their passions are easily roused, and in the pursuit of revenge their bearing is marked by ferocity and cruelty. When first visited by Europeans, and even until within a comparatively recent period, they were addicted to cannibalism, drinking the blood of their enemies, and feasting on their remains, baked in ovens scooped in the earth. They readily adopt such of the habits and pursuits of the European settlers as appear conducive to their own immediate advantage. In some districts they have considerable tracts of land under cultivation, and bring their produce to the market as regularly as the peasants of other lands. They also make good sailors and fishermen, but, as a rule, will not work very hard. They are divided into tribes, each under its own head or chief, bound together by clannish attachment.

Formerly the practice of tattooing the body was almost universal, but it has been generally abandoned since their conversion to Christianity. It was a very painful operation, performed with a hammer and saw-like chisel. The patterns represented ornamental scrolls and figures, to denote the rank of the individual wearing them. The punctures were stained with indelible vegetable dyes, and made the face present a most hideous appearance, although it was supposed to make the Maori youth more prepossessing in the eyes of his mistress.

Infanticide was also formerly prevalent, but is now entirely abolished. The chief difficulties to peaceful progress of colonization in New Zealand have been with the Maories, who, although agreeing in the first instance to the cession of their country to the queen, strongly resented the enlarging settlement of the white race. From 1844 to 1865 a series of bloody and often perilous wars prevailed with but little intermission. Trouble arose with Te Whiti, the Maori prophet, and some of the tribes in 1869, and again in 1881, there being in the latter year no less than 500 Maories in prison for trespass on the lands of the settlers. The colonists now, however, are sufficiently strong to cope with any difficulties of this kind, especially as the unfortunate native race is fast diminishing. When the country was first colonized they were estimated to number 120,000, and to the handful of whites they were extremely formidable. The whole of the tribes only counted about 40,000 in 1881, and were located almost entirely in North Island. Even those now surviving are by no means of pure stock. Association with white men has resulted in much intermixture. In their former wars they used spears and clubs, but they are now expert in the use of firearms. In 1884 their king or principal chief visited England in order to press the claims of his people on the government in person.

Their language belongs to the Malay family, and seven different dialects are spoken. It is rich and sonorous, and well adapted for poetical expression, especially of the lyrical kind. They have many proverbs, legends, and traditions, and an interesting collection of them was made by Sir George Grey, at one time governor of New Zealand.

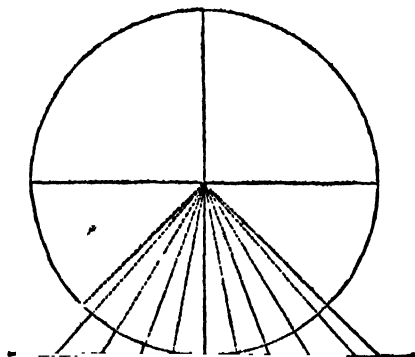
**MAP** (in Latin, *mappa*, a cloth; in French, *mappe-monde*, a map of the world). A map is the representation of the surface of a sphere or a portion of a sphere on a plane. The name, however, is commonly applied to those plane drawings which represent the form, extent, position, and other particulars of the various countries of the earth. One of the oldest maps is the "Mappa Mundi" of Hereford Cathedral, certainly as early as 1250, perhaps earlier.

Maps, being plane representations of the surface of a sphere, may be obviously applied to various purposes; hence we not only have terrestrial maps to represent the surface of the earth, but celestial or astronomical maps to represent the sphere of the heavens; and these general distinctions have again their subdivisions. There are two kinds of terrestrial maps—geographic or land maps, and hydrographic or sea maps: the latter are usually called *charts*. The methods adopted in the construction of maps are as various as the taste and judgment of geographers themselves, but they may all be referred to two principles, viz. *projection* and *development*.

By *projection* is meant the representation of the surface of a sphere on a plane, according to the laws of perspective. By *development* is to be understood the unfolding or spreading out of the spherical surface on a plane. This, however, first supposes the sphere to be converted into a cone or a cylinder; these being the forms portions of which most resemble portions of a sphere, and which, at the same time, are susceptible of the required development. There are three methods of spheric projection in general use, the *gnomonic* or *central*, the *stereographic*, and the *orthographic*, distinguished from each other by the different positions of the projecting point in which the eye is supposed to be placed.

#### PROJECTION.

The *Gnomonic* or *Central Projection* supposes the eye to be placed in the centre of the sphere, and that the various

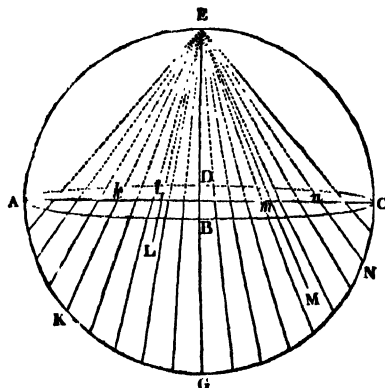


Gnomonic Projection.

objects to be delineated are transferred from a sphere to a plane, which is a tangent to its surface. The entire hemisphere can never be represented by this projection, since the circumference which terminates it is on a level with the eye, and is therefore parallel to the plane of projection. This method is chiefly used in dialling, but may be advantageously applied to maps of a limited extent, more especially if they are maps of the polar regions of the globe. In this case the meridians will be straight lines radiating from the centre, and the parallels of latitude concentric circles, whose

distances from the centre will respectively be equal to the cotangents of their latitudes. In the other cases of this projection, where the perspective plane is parallel to the horizon, or to any meridian, the construction is rendered troublesome on account of the parallels of latitude becoming curves of difficult delineation: these cases therefore are seldom brought into use.

*Stereographic Projection.*—In this projection the eye is supposed to be placed at the surface of the sphere, and to view the concave of the opposite hemisphere through the plane of that circle in the pole of which the eye is placed.



Stereographic Projection.

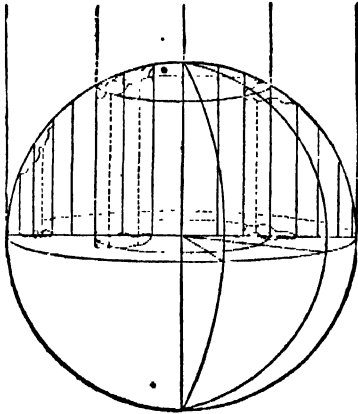
If *E* be the eye, and *A B C D* the hemisphere to be represented, *A B C D* will be the plane of projection; and the position on this plane of any point of the spherical surface will be indicated by a line drawn from that point through the plane to the eye. Thus the points *K, L, M, N*, on the sphere, will be transferred to the plane at *k, l, m, n*. The advantages offered by this method of projection have brought it more into use than the other two methods. It is especially calculated for maps of the world, as usually made in two hemispheres, from the circumstance of the representation being less distorted, and also on account of the meridians and parallels intersecting each other at right angles, as they do on the globe. Its construction also is less difficult than others, since all the great circles of the sphere are either circles or straight lines in the projection. The meridian of 20° W. is the one usually selected by English geographers for the plane of projection in these maps of the world, because this meridian passes very nearly between the eastern and western continents, which therefore occupy their respective hemispheres.

*Orthographic Projection.*—In this projection the eye is supposed to be at an infinite distance, so that the visual rays leave the sphere in parallel lines. The perspective plane on which a hemisphere is supposed to be delineated is the plane of that diameter which is perpendicular to the visual rays—hence every point of the hemisphere is transferred to this plane by perpendiculars let fall upon it. It will be immediately seen from the figure, that the representation will decrease in accuracy with the increase of distance from the centre; the parts near the circumference being much foreshortened and distorted.

In a *Polar Map* of this projection the meridians, as in the gnomonic maps, will be radii, and the parallels concentric circles; these circles, however, will have their distance from the centre equal to the cosines, and not to the cotangents of their respective latitudes.

In an *Equatorial Map* of this projection the equatorial regions of the globe are made to occupy the centre of the

map, and the plane of projection coincides with the plane of one of the meridians. In this case the latitude circles will be projected in straight lines parallel to the equator, which is also a straight line, and will vary in distance from it according to the sines of their respective



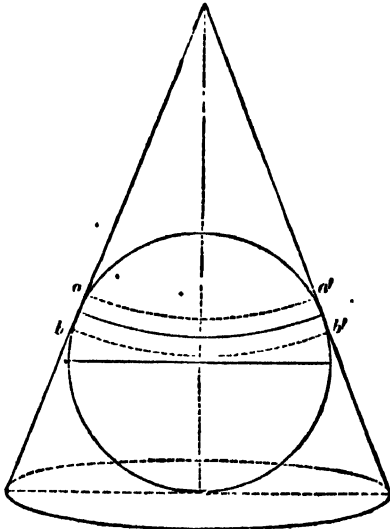
Orthographic Projection.

latitudes. The meridians will be portions of ellipses intersecting the equator in points similar in position to the intersecting points of the parallels on the polar diameter, and having their transverse axes coincident with this diameter and equal to it.

#### PROJECTION BY DEVELOPMENT.

The developments to be mentioned are two—the *conical* and *cylindrical*.

**Conical Projection.**—In this projection the sphere is supposed to be circumscribed by a cone, which touches the



Conical Projection.

sphere at the circle intended to represent the middle parallel of the map. If the points on the sphere be now projected on the cone, by lines drawn from the centre, it is clear that in a zone extending but a short distance on each side the middle parallel, as the zone  $a a' b b'$ , the points on the cone would very nearly coincide in position

with the corresponding ones on the sphere. All the delineations having been thus made, the cone is then conceived to be unrolled or developed on a plane surface. Should the map be made to extend much above or below the middle parallel, the distant parts will be very much distorted. To remedy the defects of this projection, various modifications have been suggested, among which those of Flamsteed are generally held in the highest estimation.

**Cylindrical Projection.**—From what has been said of the cone, it will be easily understood that a cylinder may be applied to the sphere in a similar manner, and that a zone of a very limited extent in latitude may, without very material error, be developed on a cylinder. The peculiarity of this method is that the meridians, as well as the latitude circles, are projected in parallel straight lines—a condition of the map which makes it very applicable to nautical purposes, and on which is partly founded the very ingenious method called *Mercator's projection*, now universally adopted in our charts, and to which, in conclusion, we will briefly allude.

**Mercator's Projection.**—The line on which a ship sails, when directing her course obliquely to the meridian, is on the globe a spiral, since it cuts all the meridians through which it passes at equal angles. This circumstance, combined with others, rendered a map constructed on the principles of the spherical projections very inadequate to the wants of the navigator. Mercator considered, very justly, that mariners do not employ maps to know the true figures of countries, so much as to determine the course they shall steer, and the bearing and distance of those points or places which lie near their track; and this projection is the result of his efforts to secure to the seaman these desirable ends. The merit of this most useful method is thought by many to be more justly due to Wright; for although Mercator published his first chart in 1566, he omitted to declare the principles on which he proceeded, and his degrees of latitude did not preserve a just proportion in their increase towards the poles. Wright, in 1599, corrected these errors, and explained the principles of his improved construction, in which the degrees of latitude on the chart were made to increase towards the pole in the same ratio as they decrease on the globe; so that the course a ship steers by the mariner's compass becomes on the chart a straight line; the various regions of the map, however distorted, preserve their true relative bearing, and the distances between them can be accurately measured. (Consult Jamieson, "On Maps;" Malte Brun, "Géographie Universelle;" and De Morgan, "Explanation of the Gnomonic Projection of the Sphere.")

**MAP or MAPES, WALTER DE**, one of the main authorities for the reign of Henry II., and one of the creators of the legend of the Holy Grail and the Knights of the Round Table. He was born on the Welsh border about 1140, studied at the Paris University in 1160, became attached to the court of Henry II., and was one of the justices in eyre 1178. He was a delegate of the king's to the Lateran Council in 1179, and became his chaplain in 1190. He died about 1195. The whole chit-chat of the time is swept together in his "*Nugæ*" (Trifles), and a valuable if veiled account of the Becket controversy is given in his "*Bishop Goliath*," a fierce satire against the greed and selfishness of the church officials, the drunken, lewd, gross Goliath towering above them all, and Map posing as the David with a little book for his stone wherewith to overthrow the monster. Too drunk to hold his wine cup, in one passage Goliath roars out the well-known song—

"Mihl est propositum in tabernâ mori"  
(I have determined to die drinking in an inn), because, says he,

"Dens sit propitius huic potatori"  
(God will sure be merciful to a good toper).



As regards the Arthurian legend, this interesting and varied old writer is of great interest. The "Little Grail" had already been produced, but it was Map who in the "Great Holy Grail" gave it with its full majesty, though still keeping clear of definite connection with King Arthur. Afterwards he produced the really magnificent romance, "Lancelot of the Lake," and then the mystical "Quest of the Holy Grail," with the knight of purity, Sir Galahad, and the knight of chivalry, Sir Lancelot, as its heroes. Finally, he wound up the whole and connected it with the Arthurian legends in the "Mort Artus." It is not too much to say that Map founded the chivalrous style in literature; the elaborate and romantic religious and mystical feeling, the imaginative and allegorical narrative, and the striving after refinement of manners, while yet unspotted courage and rough hardihood are retained, are the well-known elements of this style, fascinating to lovers of antiquities.

As a specimen of Old French the following may be perused from "Lancelot of the Lake":—

"Atant sont venu li chevalier jusqu'au pont; lors commencent a plorer (weep) top durement tuit ensemble. Et Lancelot lor demande pourquoi il plorent et font tel duel (mourning). Et il dient (they say) que c'est por amor di lui, que trop est perillox li pontz (bridges)," &c.

**MAPLE** (*Acer*) is a genus of trees or shrubs, many of which are extremely valuable for the sake either of their timber or of their ornamental appearance. They are for the most part hardy. The maples belong to the order SAPINDACEÆ, and are chiefly distinguished by the exalbuminous seeds and opposite leaves. The flowers are regular, polygamous; the calyx is generally five-parted; the petals of the same number, or wanting; the disc is in the form of a ring; the stamens, generally eight, inserted on the disc; the ovary is two-celled, with two ovules in each cell; the fruit is formed of two samaras or "keys," each containing one or sometimes two seeds; the leaves are simple. There are about fifty species, natives of Europe, North America, the Himalayan region, Java, and a few of North Asia. They form extensive forests in North America.

*Acer campestre* (the common maple) is found in every hedgerow in England, and spread over the greater part of Europe. It is said not to be indigenous in Scotland, and on the Continent it does not approach the north nearer than the southern provinces of Sweden. In England it is either a bush or small tree; the wood makes excellent fuel. The ancient Romans were fond of making tables of the wood, which is of a fine grain, and often beautifully veined.

*Acer Pseudo-platanus* (the sycamore maple). This noble tree is scarcely met with in a truly wild state beyond the limits of middle and southern Europe; it is considered wild on the edges of the high moors of Northumberland and in Scotland. Occasionally seen on the lower ridges of the Caucasus, it does not appear to extend much further eastward. Its English name has originated in an erroneous notion that this is the sycamore of Scripture—a totally different tree, for an account of which see FIG. Although the wood of this species is not particularly valuable, being chiefly used for coarse work, where lightness and toughness are required, yet there is scarcely any more universally cultivated for the sake of the striking effect it produces, whether as a single tree, or planted in avenues, or in masses. It thrives upon poor sandy or gravelly soil, especially near the sea, where few other trees will succeed; and will even bear the smoke of London, although not so well as some others.

*Acer striatum* (the striped-bark maple) is a native of North America, from Canada to Georgia. It forms a considerable part of the undergrowth of the woods, among sugar-maples, beeches, birches, and hemlock-spruce firs. It rarely exceeds 10 feet in height, except in a few very favourable situations, when it will occasionally grow double

that height. Its wood is very white, and is used for inlaying cabinet-work; its shoots afford food to various animals, especially to the moose-deer, in winter and spring, whence it has acquired the name of moose-wood. In Europe it is occasionally seen in plantations, where it is remarkable for the bright rosy tint of its young leaves in spring.

*Acer obtusatum* (the Neapolitan maple) is a native of Hungary, Croatia, and many parts of Italy. Its leaves are five-lobed and woolly beneath. On all the hills near Naples it is found abundantly, growing usually to the height of 40 feet. It is extremely striking, with its reddish-purple branches; in Calabria it acquires colossal dimensions.

*Acer tartaricum* (the Tartarian maple) is an ornamental tree or bush, 20 feet high, often met with in gardens. It extends from mid Asia as far as Hungary. The Kalmecks call it *zarza-modon* or *locust-tree*. From its keys, deprived of their wings, they form, by the aid of boiling water, an astringent beverage, which, mixed with milk and butter, forms a favourite article of their diet. The wood is hard and white, mixed with brownish veins.

*Acer lanigatum* (the polished maple) is found in the woods of the temperate Himalayas and Khasia, where it acquires a trunk 40 feet high and 4 feet thick. The leaves are like those of the following species, but are glossy on both sides and the veins strongly marked. Its growth is slow; its timber is used in Nepal for building purposes.

*Acer oblongum* (oval-leaved maple) is an evergreen tree, of rapid growth, 50 feet high, native of the temperate Himalayas, Hong Kong, Loehow Island. Its leaves are 3 to 7 inches long, without any divisions, of an ovate figure, tapering into a narrow point; they stand upon slender footstalks, and are smooth and glossy above; beneath they are covered with a slight bloom, and are finely netted.

*Acer platanoides* (the Norway maple) is a fine tree, with very handsome glossy deep-green leaves, for the sake of which it is a great deal cultivated. The northern and midland parts of Europe produce this species. It passes from the state of a shrub, in the north, to that of a handsome tree with a trunk 2 feet thick, in more southern districts. Its wood is valued for turners' work; from its ascending sap a kind of coarse sugar has been procured, in the same way as from the *Acer saccharinum*, in America. When the footstalks of the leaves are broken they exude a milky fluid.

*Acer saccharinum* (the sugar maple). From Canada to Georgia this species prevails, sometimes becoming as much as 80 feet high. In the autumn the woods of those countries are dyed of a crimson hue by the changing leaves of the sugar maple. The wood is hard, and has a satiny lustre, but it is readily attacked by insects, and is not of much value, except when its grain is accidentally waved, and then it is in request for the cabinet-makers. The saccharine matter contained in its ascending sap is the principal cause of this species being in so much request. From this sap, obtained by tapping the trunk in the spring during the space of six weeks, a very considerable quantity of a fine brown sugar is procured; as much, it is said, as 33 lbs. per tree. The sugar maple does not generally succeed in England.

**Cultivation.**—The hardy maples, which are the only kinds of any importance in this country, are all increased either by seeds or layers. The European species readily yield their keys, which should be gathered when fully ripe, and immediately buried in heaps of river sand, where they may remain till the following February; they may then be sown in beds, rather thinly, and when one year old should be transplanted, and treated like other forest trees. They ought never to be headed back, as oaks and Spanish chestnuts are. From layers they all make excellent plants very rapidly.

**MAPLE SUGAR.** sugar obtained by evaporation from the juice of the Sugar Maple (*Acer saccharinum*).

**MAR'ABUTS** or **MARABOUTS** (from the Arabic *mar'abil*, a devotee), a hereditary semi-priestly class of North Africa, who are highly esteemed among the Mohammedans for their supposed sanctity and miraculous powers. They officiate in the mosques, interpret the Koran and Mohammedan law, provide the faithful with amulets, and have a decisive voice in intertribal quarrels and political affairs. They are liberally supported by alms, and their pretended miracles, which consist in the chewing of glass, swallowing of bullets, leaning on the edges of swords, &c., are devoutly believed in by the ignorant portions of the populace. The Marabuts offered a strenuous resistance to the French in Algeria, and the renowned Abd-el-Kader belonged to their order. Robert Hondin was employed by the French government, in 1856, to detect the methods by which the Marabuts imposed upon the people, and to give an exhibition of his own conjuring in order to impress the natives with a sense of French superiority. He readily discovered, though he did not expose, the clumsy tricks of the Marabuts, but they were completely at a loss to account for the wonders he presented in his turn.

**MARANHAM** or **MARANHAO, SAN LUIZ DO**, a town and port on the northern coast of Brazil, situated on the north-western shore of the island of Maranhão. It has 40,000 inhabitants. The city is the fourth in rank and importance, and the best built, in the Brazilian Empire. It is remarkably clean and prosperous. An episcopal palace, college, governor's residence, theatre, hospital, and numerous convents form the principal public buildings. There are also a lyceum and schools of navigation and commerce. The city has a very high rainfall, amounting to an annual average of 290 inches. The harbour is defended by two forts, and is of easy access for small vessels. The imports consist of wine, brandy, oil, flour, fruits, silk, cotton and linen goods, hardware and metals, spices, drugs, &c. The exports are cotton, rice, tanned and raw hides, sarsaparilla, &c. A large proportion of the imports and exports are from and to Great Britain.

**MARANTA** (arundinacea) is generally referred to as the plant from which the **ARROW-ROOT** of commerce is obtained, but it is also procured in large quantities from a variety of closely allied plants. Sloane states that the name arrow-root is derived from the use made by the Indians of the mashed root-stocks as an application to arrow wounds. Others explain the word as a corruption of the South American words *ara* *ruta*, meal root. *Maranta* is a small genus belonging to the order **SCITAMINEÆ**. The arrow-root plant reaches a height of 5 or 6 feet, and is somewhat like its ally, the Indian Shot (*Canna indica*), which is so commonly grown in our gardens, but the flowers are pale yellow. It is native in the West Indies, but is now cultivated in all tropical countries.

The root-stocks (Plate **MARANTA**, fig. 2, with a portion stripped of encasing leaves) are grated and washed with water, which is passed through a fine hair-sieve so long as it runs off with a milky appearance. The pure farina is then allowed to subside, the supernatant water drained off, and the powder dried. Arrow-root consists essentially of starch, and potato-starch is frequently used to adulterate it.

**MARAT, JEAN PAUL**, that one of all the leaders in the great French Revolution for whom no one has a good word to say, who, like Milton's arch-fiend, upon the topmost benches of the "Mountain"

\* Exalted sat, by merit raised  
To that bad eminence,"

was born at Neuchâtel, in Switzerland. 24th May, 1744. He determined to follow medicine as his profession, and came to England in 1766. He had studied electricity medically, and made good use of it; and indeed there are

recorded cases of patients of his in London whom he cured when other physicians had been unsuccessful. His address, too, was in Soho, then a fashionable quarter. He published a "Philosophical Essay on Man" in 1773, and "The Chains of Slavery" in 1774, indications of the workings within him of the revolutionary spirit; but he also published pamphlets on medical subjects, practical and well written, such as an "Essay on Gleets" (1775), and essays on diseases of the eyes, his speciality; and one of these, of nineteen pages long, still exists at the Royal Medical Society of London. It is dedicated to the Royal Society, and called "An Inquiry into the nature, cause, and cure of a singular disease of the eyes hitherto unknown, and yet common, produced by the use of certain mercurial preparations," by J. P. Marat, M.D. (1776). It is observed that he signs himself M.D., and in fact he had won such reputation for himself in his ten years' stay in the United Kingdom (visiting both Scotland and Ireland as well as England), that the University of St. Andrews, at the request of an influential section of the Edinburgh physicians, conferred the doctor's degree on him on 30th June, 1775. All this shows that Marat moved in the best society in England. One year was spent in Dublin, but as yet its exact date is not known.

In 1777 Marat was appointed physician of the Gardes du Corps of the Comte d'Artois, and at once took up his residence in Paris. It is quite false, therefore, to describe Marat as a quack, or even (vile as he afterwards was) to lower his real position, as Carlyle has innocently done, not knowing the above recently discovered facts, by calling him a "horse-leech." ("Prince D'Artois has withal the strangest horse-leech, a moonstruck, much-enduring individual;" "French Revolution," vol. ii.) It is necessary also formally to deny and explain the oft-repeated tale that Marat was a teacher of French at Warrington Academy, was condemned to five years' penal servitude for robbing the Ashmolean Museum at Oxford, set up as a bookseller after serving his time, and failed at Bristol, and was recognized on the benches of the Convention by a person who had charitably relieved him at Bristol. These facts (except the last, which is of course an invention) apply to a J. P. Mara (Jean Pierre Mara, *alias* Matra, *alias* le Maître), whose conviction for the robbery named was on 6th March, 1777, when Baron Eyre sent him to the Thames hulks for five years. Jean Paul Marat was at this time on his way to Monseigneur d'Artois in Paris, where he was formally installed on 24th June. The trial of Mara or Matra may be read in the *Annual Register* for 1777, p. 184. Marat worked as physician quietly; worked also, we surmise, as revolutionary. But when the days of July began in 1789, and Camille Desmoulins harangued the excited people outside the Café Foy in the Palais Royal, and the Revolution sent forth its preliminary shocks, Marat printed a famous "Advice to the People" (*Avis au Peuple*), dated 1st July, 1789, wherein he implores the hungry, angry people still to abstain from violence. Nevertheless, at the attack on the Bastille (14th July), when a few soldiers arrived at five o'clock (the firing having begun at one), and the fate of the Revolution trembled in the balance, it was a "large-headed, dwarfish individual of smoke-bleared aspect who shambled forward, opening his blue lips, for there was sense in him, and croaked, 'Alight, then, and give up your arms.' The hussar captain is too happy to be escorted to the barriers and dismissed on parade. Who the squat individual was? Men answer, it is M. Marat, author of the excellent pacific 'Avis au Peuple'" (Carlyle).

Marat now advanced to the head of the movement. Mirabeau might have welded France into a new nation, but his death ruined all. On the ultra-revolutionary side stand Marat, Danton, and Robespierre, and their true influence is in this order. For had not Marat perished by

the assassin, and had not Danton's splendid courage left him defenceless, the much smaller mind of Robespierre could never have attained to the supreme power. Of these three revolutionaries Marat, at all events, became practically insane. M. Taine in his fine work, "*Les Origines de la France Contemporaine*" (Paris, 1886), very carefully details the evident proofs of this. M. Taine points out that—

"He is almost a lunatic. He possesses all the principal traits of the lunatic; the furious exaltation, the continued over-excitement, the feverish activity, the unfailing flow of words, the automatism of thought and the will, lockjawed under the constraint and direction of the fixed idea; besides, he shows the ordinary physical symptoms—insomnia, a leaden complexion, a burning blood, personal uncleanness, and, during the last five months, tetters and itchin all over his body.

In politics he holds with the insane notions of the rabble, rendering them more insane still by his coarse socialistic reasonings, and by adopting the method of misled physiologists who found right on physical want. Imagining himself the righter of all wrongs—

"He is the great political physician; since the commencement of the Revolution his diagnosis has always been sure, his prognostic infallible, his therapeutic efficacious, humane, and salutary. He brings the pueraria, let him administer it; only, in order to effect a cure, he must administer it himself. Put, therefore, the public lancet into his hands that he may practise humanitarian bleeding.

"Every physician will by these traits recognize that Marat is the victim of 'ambitious delirium,' well known in the asylums. The disease grows till it becomes homicidal monomania. . . . From the first months of the Revolution this disease has shown itself in Marat; it is innate, inoculated; knowingly and by principle he has contracted it; and from the beginning to the end of the Revolution he has been the enlightened, doting lunatic among an insane mob, reaching at one bound the pinnacle to which his rivals climbed laboriously after him."

From December, 1789, to September, 1792, Marat, oftenest from hiding-places, sent forth his abominable inflammatory sheets called *L'Ami du Peuple*, frightfullest of newspapers, one long shriek for revenge, plunder, and blood. He was often summoned before the Constituent (National) Assembly in the beginning, but always escaped; and when afterwards his ravings grew more violent he refused to attend, and hid from their summons. He had determined to force the hand of Mirabeau and the constitutional reformers. "These prating senators," he yells, "cannot save the revolution; 260,000 aristocrats' heads, that is what is needed." Or another time, when Barbaroux had gone to

him, attending some lectures on optics that Marat was giving at the time, the latter said, with as much coolness as he could ever muster, "Give me 200 Naples braves, each armed with a good dirk and a muff on his left arm by way of shield; with them I will traverse France and accomplish the Revolution" ("*Memoirs of Barbaroux*," Paris, 1822). Again in *L'Ami du Peuple*, No. 306, one may yet read him advising plunder and murder in calmly reasoned details, really meant to be carried out, as one has to acknowledge with a sickening horror, "What man has a right to dine when you have no bread?" begins he; then continues, "O people! treason, delusion, from Duménil to Beersheba! What remedy? Eight hundred gibbets, convenient in rows, Riquetti (Mirabeau) on the first of them." The list need not be extended, but in these days, when men are found to glorify the bloodthirsty brutal demagogues of the Revolution, it is imperatively necessary to put them in their true light. What is given is a sample, not an exceptional passage, from the second year of *L'Ami du Peuple*.

Marat's bust, with those of Mirabeau, Franklin, and others, decorated the hall of the Jacobins Club; but that

great society was too lukewarm for him. He helped to found the rabid Cordeliers Club in 1790, and here occasionally his harsh voice would utter the horrors which more often were promulgated by his pen. Everywhere that action was begun Marat was to be found. With his own hands he pulled the rope which rang the tocsin on the night of 9-10th August, ushering in that awful massacre of the Swiss Guards which yet wrings the heart with shame at the lethargic king, whose faithful followers were allowed to be shot like dogs. From these horrors arose the great Paris Commune (or Municipality), and at its sittings the "friend of the people" was an honoured guest; he even had apportioned to him a "tribune of honour," whence he sent forth, as he watched the debates, his sheets, now called *Journal de la République*. One ardent admirer styled him, as he pointed him out, "the conscience of the Hotel de Ville." What a conscience this was may be judged from the fact that a circular yet exists, signed by Marat and nine others, sent to all other town-halls in France from that of Paris, complaining that only "a part of the ferocious conspirators detained in the Paris prisons have been put to death by the people" (in those September massacres which perhaps mark the greatest crime of this awful period), and demanding that the remainder shall be put to death. "We make no doubt but that the whole nation, driven to the edge of ruin by such endless series of treasons, will hasten to adopt this means of salvation" (dated 3rd September, 1792). Marat was elected with acclamation a deputy to the Convention (21st September, 1792), and it was not a month before he appeared in the character of a delegate from the Jacobins, and publicly reprimanded General Dumouriez to his face for "not having chased Brunswick hotly enough," when Dumouriez had come to Paris after his brilliant victory over the Prussians, so great was the position Marat had at once obtained in the new assembly. And yet on his first appearance in the tribune to answer outcries against his journal as an offence against public decency, he was met with a storm of execration. "It seems," he said as soon as he could be heard, "that many here are my enemies." "All, all!" shouted hundreds of voices. But before that very sitting was over Marat had evaded the charges and had won his point; whereupon, drawing a pistol he declared, "Behold! citizens, had you passed your accusation decree, with this I, the 'friend of the people,' would have blown out my brains; and as to my demand for 260,000 heads of aristocrats, that is my opinion of what is necessary," and no man was found to shout execration this time. Later on, upbraiding the people for suffering hunger, he suggested the hanging of certain holders of corn on their own door-frames as a remedy; and the Girondins felt themselves powerful enough to fling him into prison for it. It was their first great failure, for the revolutionary tribunal would not convict. Marat issued from prison to be carried along the streets in a chair of triumph borne on men's shoulders, crowned with an oak garland, 24th April, 1793. By the 2nd of June the Girondins in their turn in prison; the squalid "people's friend" had conquered, and very different was their fate.

The horror and hatred of this bloodthirsty madman penetrated all well-thinking minds, and among others that of a young republican girl, a friend of Barbaroux, and a native of Caen, named CHARLOTTE CORDAY. On Tuesday, 9th July, 1793, four years after Marat had dismissed the hussars at the Bastille, this girl, determined to be his murderess if she could, left Caen by coach. On Thursday 11th she arrived at Paris, visited the Convention during Friday, and found Marat was ill and at home; and on Saturday 13th, with a large sash-knife which she purchased on the road, she demanded to see Marat at his residence, 44 Rue de l'Ecole de Médecine. He was too ill, they said. She sent him two notes during the day,

alleging news from Caen of the renewal of Girondist plots. At seven in the evening she again took coach and went to Marat's house. Marat, hearing her voice insisting upon admittance, cried from his bath-room to admit her. He was lying in a slipper bath, excessively weak of a wasting skin disease, with a three-legged stool beside him for a writing table; all the money in the house was elevenpence halfpenny. Sick, poor, and squally wretched was this most powerful man in the republic. Asking Charlotte to be seated he took paper to write down the names of those Girondists who had escaped to Caen. "Their heads shall fall within a week," he croaked as he wrote one after the other, at Charlotte's dictation. "Barbaroux, Pétion, Louvet" . . . Further he did not write, for as he turned more on one side the girl saw her opportunity, and plunged the knife in his side. He called to his mistress-housekeeper, "A moi, chère amie!" and died instantly. Charlotte Corday perished by the guillotine four days later; and her crime is the admiration of posterity. She says truly, "I killed one man to save 100,000." Meanwhile Mirabeau's dust was disturbed at the Pantheon to make room for the remains of Marat. The Jacobin Society likened him, in their funeral eulogium, to one whose holy name it were a blasphemy to use in such connection, and whom they dared to style "a good Sansculotte himself." A chapel was built on the Place du Carrousel to hold his heart, children were named after him, David painted his "martyrdom," and such other apotheosis as human genius could devise took place, but Marat returned no more to the light of the sun, and the upper earth was well rid of a monster.

**MARATHON**, a small plain in the north-east part of Attica, about 5 miles in length and 2 in breadth, which is chiefly memorable for the victory which the Athenians under Miltiades gained over the Persians here, B.C. 490. The Athenians who fell in the battle were buried in the plain; and also, but apart from the Athenians, the Plataeans, Boeotians, and slaves. A large tumulus of earth still rises from the centre of the plain, and near the sea there are two others, much lower than the former; but Dr. Schliemann, investigating the large one in 1884, discovered that it was undoubtedly a prehistoric burrow of the rudest stone age. The modern Vrana stands on the site of the ancient village of Marathon. See MILTIADÆS.

**MARBECK** or **MERBECKE, JOHN**, organist of St. George's Chapel, Windsor, is famous as the first writer of Protestant church music in England. He was always inclined to the doctrines of the Reformation, and was arrested while yet a chorister at Windsor, in 1544, for copying Calvin's sermons, &c. He and three others were condemned to the stake, Marbeck alone being saved by the friendship of Gardiner, bishop of Winchester, all-powerful at this time. But at the death of Henry VIII. Marbeck published his *Concordance*, and immediately after his "Book of Common Prayer, noted," which is in the main an adaptation of the ancient "Plain Song of the Romish Church" to the first Protestant prayer-book of Edward VI. Escaping rather unaccountably from the persecutions under Mary, Marbeck published several curious works, chiefly polemical (as "The Kipping up of the Pope's Fardel," &c.), under Elizabeth. He died in 1585. A fac-simile of the famous "Common Prayer noted" was published by Whittingham in 1844, and many reprints in ordinary notation have appeared in works on the history of church music.

**MARBLE** is the name applied to a highly crystalline compact limestone, with a close and even grain, and capable of receiving a high polish. Although a marble is, strictly speaking, a limestone, there are some other kinds of stone, as the serpentines, that are often called marbles.

Marbles occur in rocks of all ages which contain limestone deposits, and are more or less metamorphosed. To be of economic value the stone must not only have an even grain, but it should be free from minerals liable to decon-

pose or discolour, and it must occur in blocks of large size. The marbles of different countries and quarries vary greatly both in colour and texture, but almost each has its special use, and some of the quarries are of wide repute and the stone highly valuable.

Of marbles prized for statuary purposes the most highly esteemed are probably the Parian and the Carrara. The first was obtained from the island of Paros, in the Greek Archipelago, and has a soft waxy appearance, but is rather hard and liable to discolour slightly. Carrara marble is obtained from the quarries near Spezzia in Italy; it is a fine white saccharoid marble that works easily under the chisel, and takes a good polish. The quarries were first opened about the time of Julius Caesar, and have since been of high repute. Of other famous statuary marbles may be mentioned the Pentelic marble and that from Mount Hymettus, both found in the vicinity of Athens. In this country the Carrara marble is much used for fine work, but for outdoor purposes the Sicilian, with black veining, lasts better. Though small specimens of beautiful white marble have been obtained from many other localities in Europe, it does not appear that it exists in sufficient quantity or in blocks of sufficient size to be of much economic value.

The marbles found in the British Isles, though highly valuable for ornamental purposes, and of great variety in colouring and marking, are not adapted for statuary purposes. From the Devonian formation handsome marbles are obtained, which present warm and pleasant tints, and take a good polish; the chief quarries are at Oreston, near Plymouth, and at Applepen.

In the carboniferous limestone there are a great variety of marbles, varying much in colour. Fine black marble is obtained from Derbyshire and Yorkshire, and from Kilkenny in Ireland. Emericinal marble is another feature of the carboniferous limestone. It constitutes a handsome stone, the ground being gray or black, through which the white fossils, cut in various directions, present a great variety of forms; it is much used for chimney-pieces. Near Cork a handsome reddish stone is obtained.

Ruin or Landscape marble is from a gray limestone that occurs at Cotnam, near Bristol; when cut and polished the markings are supposed to represent a landscape with trees and ruins.

The Parbeck marble is sometimes used for architectural decoration; the rock is of a dark colour, and is crowded with fossil shells of the genus *Paludina*.

Of marbles that are not limestone may be mentioned the Rosso Antico and Verde Antico, which are porphyritic breccias; the Lizard Serpentine appears to be an altered diallage rock, and is of igneous origin, while the Serpentine of West Galway, known as Irish Marble, Green Marble, Connemara Marble, &c., are bedded deposits of the rock opheleite. The green and variegated serpentines of Canada, which occur in the Laurentian formation, are considered to be altered forms of a bedded volcanic rock. Other marbles of note that may be mentioned are the Siena marble or Brocatello, a rich yellow, with bluish-red or purple veins; the Cipolino, having greenish zones; and the Giallo Antico, a variety now very rare.

**MARBURG**, a town of Germany, the capital of the circle of Ober-Hessen, in the province of Hesse Nassau, Prussia, most beautifully situated on the Lahn, and on the railway to Frankfurt, 48 miles S.W. of Cassel. The town, which is partly surrounded with a wall pierced by five gates, has a university with a library of 14,000 volumes, an anatomical theatre, a chemical laboratory, a botanical garden, &c. The university was founded in 1527, and has had among its students Patrick Hamilton and William Tyndale, translator of the English Bible; it has now forty professors, and an average of 600 students. The Church of St. Elizabeth, in the Pointed Gothic style, deserves notice; and there are besides many hospitals.

Manufactures of linens, stockings, and leather are carried on, and there are also extensive potteries and tanneries. The population in 1881 was 11,255. In the castle the famous disputation between Luther, Zwingli, Melancthon, and other reformers took place in 1529. They met on the invitation of Philip the Generous, with a view to adjust their differences regarding the Eucharist; but the attempt proved abortive, owing to Luther's tenacious adherence to the precise words, "*Hoc est corpus meum*," which he wrote in large letters on the wall.

**MAR'CASITE**, or White Iron Pyrites, is a dimorphic form of sulphide of iron; it differs from ordinary iron pyrites in crystallizing in the rhombic system, in being paler in colour and much more liable to undergo decomposition. It occurs frequently in radiating combinations; hence some varieties are called *Radiated* or *Hepatic pyrites*. Not uncommonly it forms the casts of fossils, especially in the *Lias* formation, but these are most liable to disintegrate.

**MARCEL'LO, BENEDETTO**, a patrician of Venice, son of Agostino Marcello, a senator, was born in 1686. He studied music under Gasparini and Lotti, and in 1716 a senenata from his pen on the birth of the first son of the Emperor Charles VI. was performed at Vienna. His great work, published in eight volumes folio in 1724 and 1726, was "*Estre Poetico-Armonico, Parafrasi sopra i 50 primi Salmi, Poesia di G. A. Giustiniani, Musica de B. Marcello, Patrizi Veneti*." These psalms are justly considered one of the grand works of musical literature. They are better known than is usually thought, for many composers have pillaged them, notably Rossini in his "*Maometto Secondo*." Marcello composed many other works, among them five madrigals, and several have survived. He was one of the Forty, and Provveditor of Pola. He died in 1739.

**MARCEL'US, MARCUS CLAUDIUS**, born of a Roman consular family, after passing through the offices of *ædile* and *quæstor*, was made consul, *n.c.* 222. At the beginning of the second Punic War, Marcellus was sent to Sicily as prætor to administer the Roman part of the island and to keep the Syracusans firm to their alliance with Rome. After the battle of Cannæ he was recalled to Italy to oppose Hannibal. He took the command of the relics of the Roman forces in Apulia, kept Hannibal in check, and defended Nola. In the year 214 *n.c.*, being again consul, he took Casilinum by surprise. He was next sent to Sicily, where Syracuse had declared against Rome. After a siege of nearly three years, the town was taken in the year 212 *n.c.*, and in the tumult Archimedes, the great mathematician, lost his life. In the year 210 *n.c.* Marcellus was again chosen consul, and had the direction of the war against Hannibal in Apulia in this and in the following year. In *n.c.* 208 Marcellus was elected consul for the fifth time. He continued to carry on the war against Hannibal, when, being encamped near Venusia, he fell into an ambuscade and was killed. Hannibal caused his body to be buried with honours. He was one of the most distinguished Roman commanders during the second Punic War, and had the honourable reputation of being a disinterested man. Marcellus was held to be the "*sword of Rome*" during the Hannibalic war, as Fabius was its "*shield*."

**MARCEL'US I.**, Pope (and Saint), succeeded S. Marcellinus (pope from 296-304) after a long interval caused by the dissensions of the time. He was elected Bishop of Rome on 19th May, 308, and died 16th January, 310.

**MARCEL'US II.** (Marcello Cervini), Cardinal 1539, Pope in succession to Julius III. from the 9th to the 30th of April, 1555, is rendered famous by the "*Missa Papæ Marcelli*," the mass dedicated to his memory by Palestrina, which saved music to the church. Of the many popes whom Palestrina served, Marcellus had been

kindest to him, though probably rather as cardinal than pope. The "*Missa Papæ Marcelli*" was not written till 1567, twelve years after the Pope's death. It was performed in London at the historical concerts of the International Music Exhibition (1885). See also **PALESTRINA**.

**MARCES'CENT** is a term used in botany to signify that the part referred to withers on the stem without falling off for a considerable time; thus the corolla of heaths is *marcescent*.

**MARCH**, a market-town of England, in the county of Cambridge, situated on both banks of the *Neue*, which is crossed by a bridge, 88 miles from London by the Great Eastern Railway. March contained in 1881 a population of 6190. The church is a spacious Gothic structure, and there is a commodious town-hall. The town has much improved in appearance in recent years, and is clean and well-paved. The surrounding country is flat and fenny, but has been well drained, and is a great wheat district. The church is dedicated to St. Wendreda, a very obscure Saxon saint. Her relics appear to have been brought here from Ely by Abbot Ælfsi, in 1030. According to the "*Liber Eliensis*" they were carried by the Ely monks to the battle of Assundum, and were there lost at the defeat of the English.

**MARCH**, the third month of the year according to modern computation, containing thirty-one days. The Roman year originally began with March; and in England, before the alteration of the style, the legal year commenced on the vernal equinox, 25th March. The name of the month is said to be derived from that of Mars, the god of war. It is usually a windy dry month, so that the ground becomes dusty and pulverized, ready for the fertilizing influence of the April rains, whence the proverb "*A peck of March dust is worth a king's ransom*." The last days of March are so often stormy that a curious superstition arose to account for this. See the article **BORROWED DAYS**.

**MARCH**, in music, is, properly speaking, an air in 4-4 time, played by martial instruments, to mark the steps of the infantry, as well as to amuse and cheer troops of all kinds. It has, however, long since gained admission into sacred as well as into operatic musical compositions, as, for instance, the marches in Handel's oratorios, the religious marches in Gluck's "*Alceste*" and Mozart's "*Zauberflöte*," &c. For the piano-forte and the orchestra there are also the funeral marches of Beethoven and Chopin, and the great wedding marches of Mendelssohn and Wagner. In its ground-plan or *form* the march is closely akin to that well-known musical form the *MINUET* and *TURO*; and indeed the middle division of a march is usually called a "*trio*."

**MARCHAN'TIA**. See **HEPATICA**.

**MARCHES** (Anglo-Saxon *marc*, a boundary). *Mark* is a word common to almost all the languages of Teutonic origin, in sense scarcely varying from the word as at present used, a *mark*. But from denoting a mark in general, it came to denote in a specific and peculiar sense those important marks by which the boundaries of wide domains were indicated, and in this sense it is found in Anglo-Saxon writings. Hence the words *the Marches*, that is, the country lying near and about the *marks* which indicated the limits of two kingdoms, dukedoms, or other extensive jurisdictions.

The word is used in Germany, and upon it is founded one of their titles of honour, the *markgraf* (*margrave*), or lord of the marches; and our own *marquis* is of the same origin. The *Marches* of Wales and the *Marches* of Scotland were terms in frequent use in our history until the union of those countries with England.

**MAR'CIAN** (*Markianos*), Roman Emperor of the East from 450 to 457, was born in Thracia about 391; he accompanied Aspar against Genseric at first only as a common soldier, rose to command from the ranks, and was

taken prisoner 431. The Emperor Theodosius II. made him a senator, and his sister the Empress Pulcheria thought so highly of Marcian, though he was already sixty years old, that she married him on Theodosius' death, so as to make him emperor (450). Marcian held the Council of Chalcedon, 451. His proud reply to Attila, who demanded the usual tribute, is famous: "I have steel for Attila, but no gold." Only the king's death saved New Rome from a fierce revenge for the emperor's defiance. Marcian was a blunt straightforward soldier, very successful in quelling the revolts which incessantly disturbed the empire.

**MAR'CION, MAR'CIONITES.** Marcion, the founder of the religious sect called after his name, was a wealthy shipowner, a native of Sinopé in Pontus. He came to Rome probably some time before 139 A.D., and succeeded in making some converts; but his teaching was rejected by the majority of the Roman Christians, and he was excommunicated by them on account of his heretical opinions. In consequence of this he began to form a community of his own, and he soon found himself at the head of a large and influential society, which increased rapidly in numbers throughout the Roman Empire, and had its headquarters at the imperial city. Marcion does not appear to have regarded himself as an opponent of Christianity, but rather as a reformer, and he considered the system he advocated to be a return to the pure gospel of Jesus, which he thought had been misunderstood by most of the apostles, and corrupted by the later leaders of the church. The feeling of the orthodox towards him, however, is indicated by the reply of Polycarp of Smyrna, on Marcion's asking him if he knew him—"I know thee as the first-born of Satan." At Rome he became acquainted with the Syrian Gnostic Cerdo, whose speculations seem to have had much influence over him, but he clearly occupies a position of his own in the history of the early church, and while directly opposed to the Judaizers on the one hand, he yet cannot be affiliated to any of the Gnostic sects on the other. The circumstances of his later years are unknown, but his death can scarcely have occurred much later than 165 A.D.

The system of theology propounded by Marcion seems to have been derived from an erroneous interpretation of the teaching of Paul respecting the new creation in Christ. He could not identify the Jehovah depicted in the Old Testament with the God of love, the heavenly Father of the New Testament, and hence in his system he assumed the existence of three fundamental principles or powers in the universe—(1) The Almighty and Good God, identical with the loving Father of Jesus' teaching; (2) the Demiurge, a subordinate being, a just and wrathful deity, known to us as Jehovah by the Old Testament teaching; and (3) Matter. The Demiurge working upon matter, created the body of man and communicated a soul out of his own essence. He was incapable, however, of transmuting matter by a true principle of life, and man in consequence failed to keep the law of the Demiurge and fell under his curse. Then the good and higher God, taking pity upon the condemned race of men, sent his Son down to the earth to redeem them, in the visionary form of a public teacher who appeared at Capernaum in the fifteenth year of Tiberius. The Demiurge caused Jesus to be slain, and was compelled as an atonement to deliver up the souls he had condemned; thus the blood of Jesus actually purchased their salvation. Consistently with these doctrines, Marcion rejected all the writings of the New Testament except the Epistles of Paul and an abridged edition of St. Luke's Gospel. He also composed a work on the "Antithesis" of the Old and New Testaments. After the death of Marcion his followers seem to have formed close societies; they increased considerably in numbers and influence for over a century. Their theology, however, passed through several stages of development, and during the fourth century most of them went over to the MANICHEANS.

They can be traced, however, as late as the seventh century, but after that they disappear from history as a distinct sect. See Mansel's "Gnostic Heresies" (1875).

**MAR'CIUS, ANCUS.** See ANCUS MARCIUS.

**MAR'CO PO'LO** was the son of a Venetian merchant named Niccolò Polo, who, with his brother, had travelled from 1250 to 1269 in various parts of Tartary and China. Kúblai Khan sent them back to the Pope, requesting him to send him 100 men learned in the various sciences and arts. The two Polos set out on their return, taking with them Marco, in 1271; but had not been able to enlist the 100 savants. They reached the camp of Kúblai Khan in 1275. The great Tartar sovereign was especially pleased with Marco, and intrusted him with missions to various parts of China, India, and Persia. Marco Polo was the first European who visited China Proper. After the death of Kúblai (1292), the three Venetians determined to return home, and at last arrived at Venice in the year 1295. War was then raging between Venice and Genoa. Marco obtained the command of a Venetian galley, was taken prisoner in the course of the war, and carried in 1298 to Genoa. In his captivity he used to relate his adventures, and was eagerly listened to. He sent to Venice for his memoranda at the request of his hearers, and dictated the narrative of his travels. After peace was made between Genoa and Venice (1299) Marco Polo returned home, and applied himself till his death in 1325 to correct and improve the text of his narrative. The work is entitled "Marco Polo, delle Meraviglie del Mondo da lui descritte." "The Book of Ser Marco Polo," by Colonel H. Yule, C.B. (London, 1871), is a very excellent and exceedingly interesting English edition, with notes.

**MARCOMAN'NI**, that is, the men of the mark or border, were Gerimans, probably of the Suevi, who dwelt on the borders of the Roman Empire, between the Rhine and the Danube. Hence in the reigns of Augustus and Tiberius they moved southward and dispossessed the Boii, beginning about 6 A.D., themselves thenceforward occupying the line of the Danube. They continued to give much trouble to Rome, culminating in the great wars of Marcus Aurelius (167 A.D. and onwards). That great and good sovereign died while they were still but half subdued. His successor Commodus bought peace of them (180 A.D.)

**MAR'CUS AURE'LIIUS** (emperor). See AURELIUS.

**MARDON'IOS** (Latin *Mardonius*), the son-in-law of the Persian king, Darius Hystaspis, led the first Persian expedition against Greece in the spring of 492 B.C.; but his fleet perished off Mount Athos, and his army was destroyed in Thrace. He was superseded. He persistently fanned the flame of revenge at the Persian court, and was allowed to take a high command in the second expedition under Xerxes in person. After the king's departure Mardonios held supreme command. He fell next year (479 B.C.) at Plataiæ, defeated and slain by Pausanias.

**MAREM'MA** ("maritime district"), the name given to the unwholesome lowlands in West Italy which extend along the Mediterranean. The Tuscan Maremme begin north of Lucca, and extend, with but few interruptions, from the approach of the highlands to the sea, as far as the mouth of the Pescia. They stretch inland generally from 10 to 12 miles. The Roman Maremme begin at the Pescia, and extend as far as Terracina, a length of above 120 miles, with a very unequal breadth inland, owing to the approach of various offsets of the Apennines to the sea. The whole of this tract is low, and whether the surface be marshy or dry it is unwholesome, especially in summer. Considerable success has attended the planting of the Tuscan Maremme with various species of the Australian Eucalyptus. The Maremme are the seats of volcanic action, and numerous jets of vapour issue from the ground. The vapours are commercially valuable, as boracic acid is obtained from them and used in the preparation of alum.

**MARENGO** or **MARENGO-SPINETTA**, a village in Northern Italy, on the right bank of the Bornida, and in the immediate vicinity of Alessandria. Here was fought the great battle, 14th June, 1800, between the French under Napoleon I., and the Austrians under General Melas, ending in the total defeat of the latter, with immense loss. At one time the victory was almost in the hands of the Austrian commander, but he neglected to pursue his advantage, and gave Napoleon time to bring up his reserve under Desaix, whose splendid and vigorous charge decided the fortune of the day. Desaix, shot through the head, fell at the first fire, but the French pushed on and literally drove the Austrians into the Bornida. A museum, and a monument to the memory of Napoleon, were erected on the battlefield in 1847.

**MARENZIO, LUCA**, a voluminous and excellent composer of madrigals, was born at Concegla in Brescia, about the middle of the sixteenth century, and died at Rome, where he had become one of the principal members of the papal chapel choir, in 1599. No one carried this charming style to greater perfection than Marenzio, whose madrigals are still constant favourites with good musicians.

**MAREOTIS, LAKE**, a lagoon, Lower Egypt, 40 miles long and 18 broad. It is separated from the sea by a narrow tongue of land, on which the city of Alexandria is partly situated. Its waters were formerly kept at a high level by a connection with the Nile, and the shores were then covered with rich plantations, vineyards, and gardens. Towards the end of last century it had become nearly dry, and the shores very unhealthy. It was converted into a lagoon by the English, in order to deprive the French of fresh water during the siege of Alexandria.

**MAR'ESCHAL** and **MAR'ISCHAL, EARLS**. See **MARSHAL**.

**MARGARET**, Countess of Richmond (1441-1509), wife of Edmund Tudor, was the mother of Henry VII.: she married in second nuptials Sir Henry Stafford (1459), and in third nuptials Thomas Lord Stanley (1482). She is noteworthy for her great benefactions to Cambridge University, where Christ's College was founded by her in 1505, and the splendid St. John's College arose in pursuance of her will (1511) after her death. The Lady Margaret Professorship of Divinity is also provided for from her benefactions; it was founded by her in 1502. The Lady Margaret Preachership was also founded by her in 1503.

**MARGARITONE D'AREZZO** was born at Arezzo about 1215. He was a painter of the Byzantine school, and of great reputation in his day. Most of his works have now perished, but the National Gallery possesses one of his masterpieces. The interest in his work lies in the contrast between its antique stiffness and the beginning Italian sweetness in his immediate successor, Cimabue. As an architect he superintended the building of the Cathedral of Arezzo, where he died, aged seventy-seven, and was buried.

**MARGARODITE** is a tale-like mineral; in composition, however, it resembles Muscovite mica, of which it is probably a hydrated form. It is inelastic, and has a greasy feel to the touch, like talc; but when rubbed between the fingers it produces thin plates, and not an impalpable powder, as is the case with talc.

**MARGATE**, a seaport town and municipal borough in England, in the county of Kent, 74 miles from London by the South-eastern Railway, in the Isle of Thanet, on the north coast of the county. Margate is a favourite sea bathing place, and from its north-eastern aspect, facing full upon the German Ocean, the air is somewhat more bracing and better suited to some constitutions than that of Ramsgate. The pier is a solid construction of masonry, having a lighthouse at its extremity. It was built between 1811 and 1815. It helps to form the harbour, and has a length of 900 feet and a breadth of about 60. There is also

an iron landing pier ("the jetty"), 1240 feet in length, standing at 22 feet above high-water mark. The modern streets and public structures, esplanade, squares, &c., are well built. Margate lies in the hollow, and on the declivities, of two chalk hills; has a town-hall and market-house, seamen's observatory, assembly rooms, theatre, public library, baths, several fine hotels, and three fine churches and several other places of worship. The harbour has 8 to 13 feet at high water, but is dry at low water. The Marine Terrace and Royal Crescent form a promenade 2500 feet long, protected by a substantial sea-wall. The Royal Alexandra Almshouses were erected in 1866 to commemorate the visit of the Princess of Wales. The Royal Sea-bathing Infirmary, established for the cure and treatment of scrofulous diseases, has been considerably enlarged, a handsome wing, known as the Erasmus Wilson Wing, after its donor, having been added to it. The town formerly *Meregate*, the entrance to the sea) was, from a very remote period, a limb of the Cinque Port of Dover, but the inhabitants have been successful in severing this connection. In 1857 a charter of incorporation was granted, and it is now governed by twelve councillors and four aldermen, from which body the mayor is annually elected. It is said that bathing machines were first used at Margate, and that they were the invention of a Mr. Beale, a Quaker resident of the then village. The population within the municipal limits in 1881 was 16,030; but in the "season" it often contains from 50,000 to 100,000 persons, who visit it for its excellent sea-bathing.

**MARGAY** (*Felis tigrina*) is a small spotted wild cat nearly allied to the Ocelot. The margay inhabits Brazil, Guiana, and other parts of South America, living in the woods, and preying on birds and small mammals. According to Mr. D. G. Elliot (*Proc. Zool. Society*, 1877) the species described as *Felis macrura* and *Felis mitis* are not distinct from *Felis tigrina*. The variations in the colour and markings of the fur are very great. The colour is usually gray or buff, paler beneath, and spotted with black. The tail varies in length from 13 to 19 inches, being longest in the forms to which the name *Felis macrura* or long-tailed ocelot was formerly given. The body varies from about 23 to 27 inches long, exclusive of the tail. The margay is capable of domestication, but is of a somewhat treacherous disposition.

**MARGUERITE DE VALOIS**, Queen of Navarre, and later of France (1552-1615), was sister of Francis II., Charles IX., and Henry III., children of Catherine de Médicis. She was most dissolute, like her brothers, and most capable and intelligent, like her mother, though without her consummate ability. She was married to the next heir to the throne, Henry of Navarre (afterwards Henry IV.), on 18th August, 1572, less than a week before the St. Bartholomew massacre; and came to the throne of France with her husband in 1589. Her conduct was at last so outrageous that she was banished from court in 1595: though the marriage was not finally annulled till 1599, on account of the feuds of the ministers that the king would marry his mistress, Gabrielle d'Estrées. The latter's death in 1599 set them free to act. It was necessary to provide, if possible, an heir to the throne, and Marguerite had no children. Henry married Maria de' Medici in 1600, and became by her father of Louis XIII. Marguerite died at Paris 27th March, 1615. She figures in literature on account of her vivid description of the horrors of the night of St. Bartholomew in her memoirs, the best known and oftenest quoted passages of the time. The book is dedicated to Brantôme, whose constant patron she was, and who rewards her with a loyal devotion.

Marguerite of Valois was of course Queen of Navarre from 1572 to 1589, when she became Queen of France; she must not be confounded with the much more important literary name of one of her immediate predecessors,



*Marguerite d'Angoulême*, queen of Navarre, who was the sister of Francis I. of Angoulême, king of France. This princess was born in 1492, and died in 1549; she married first the Duc d'Alençon, and then Henri D'Albret, king of Navarre. Her memory suffers under unjust aspersions on her private character. Her great work is the "Heptameron" (published after her death, in 1558), and she also is the authoress of some poems with the delightful title of "Marguerites de la Marguerite." The "Heptameron" is in avowed imitation of Boccaccio's famous "Decameron," and is of such power that it is usual, though upon no outward evidence, to credit Marguerite with help from the literary men (especially Des Périers) whom she loved to gather round her.

**MARHATTAS, MAHRATTAS, or MAHARATTAS.** The origin of this people, whose wars have filled so large a space in the history of British India, is involved in much obscurity. Inhabiting that portion of India which is known by the ancient name of *Maharashtra*, a large tract of country centring round Poonah and comprising a good part of Western and Central India, they number about 12,000,000, and occupy about 120,000 square miles of land. They have a language of their own, a dialect of the Sanskrit, and though they are essentially Hindus in religion and caste ordinances, they have always been a separate nation or people, and they still regard themselves as such, though they have now no independent existence. In the early periods of their history they seem to have submitted without much resistance to the Mohammedan conquerors of India, by whom they were held in some contempt, but in 1657 Sivaji, a Marhatta chief of humble caste, rebelled against the Mohammedan king Bijapur, and founded the new Marhatta state, which lasted for over 150 years. His son and successor Sambaji (1680), after vigorously following in the footsteps of his father, was ultimately taken prisoner by Aurungzebe in 1689 and put to death. The spirit of independence, however, was not quelled by the fall of Sambaji, and the various Marhatta chiefs continued their resistance to the emperor until they had accomplished the separation they desired. They supported and recognized a descendant of Sivaji as the Marhatta king, but from 1689 onwards the nominal ruler was deprived of all real power, and the government was carried on by the Brahman *peshwa* or prime minister, whose office became hereditary in the family of Balaji Biswanath, its first possessor. The titular king was kept in a kind of honourable seclusion in the city of Satara, the capital and residence of the *peshwa* being at Poonah. On the breaking up of the Mogul Empire four great chiefs of the Marhattas carved out for themselves independent principalities from its ruins, and one of them, Scindiah, became virtually the master of the Mogul emperor himself. His capital was at Gwalior in Central India, while Holkar reigned at Indore, the Guicowar at Baroda, and the Bhonsla dynasty occupied Nagpur, Berar, and Orissa. These chieftains, though they exercised supreme authority within their own dominions, yet owned allegiance to the *peshwa* at Poonah, and they thus formed a powerful confederation which increased in power until it supplanted the Mogul Empire. At the highest point of its power it possessed a revenue of about £10,000,000 sterling annually, and was able to bring 100,000 horsemen into the field, besides infantry and artillery. The great strength of the Marhatta army was always in its cavalry, and the horsemen were famous throughout India for their rapid marching, audacity, and prowess in fight. It has been estimated that about 1750 the area and population under the dominion and control of the confederation could hardly have been less than 700,000 square miles and 90,000,000 people. The confederation, however, was never able to establish a strong civil government, and it was weakened by the internal dissensions of the chiefs of which it was composed.

In 1761 the Marhattas were attacked by the ruler of Afghanistan, Ahmed Shah Abdali, and in the battle of Panipat they were completely defeated, losing 60,000 men and all their chiefs except Holkar. From this stroke they never entirely recovered, and twenty years afterwards they came into collision with the British power. By the genius and military ability of Warren Hastings, the Marquis Wellesley, General Lake, and other British leaders, the Marhatta power was gradually broken up and the territory occupied by its people brought under British rule. At the present time a few Marhatta states still survive under close supervision on the part of the British government, but the greater portion of the Marhattas are either directly subjects of the British government, or are included in the Nizam's dominions. In the large states of Scindiah, Holkar, and that of the Guicowar in Gujerat, only the princes and a portion of the ministers are Marhattas, the mass of the people belonging to other divisions of the Hindus.

During the period which has elapsed since the rule of the British government has enforced internal peace, the Marhattas have devoted themselves to agriculture and commerce. In the South Marhatta country cotton of excellent quality is grown, and opium is produced in Gwalior and Indore. The agriculturists hold their land upon what is practically a system of peasant proprietorship, but many of the people are farm labourers. In religion they are for the most part worshippers of Siva, and fear forms the predominant element in their devotion.

The ordinary Marhattas are of diminutive stature, but they possess great activity and powers of endurance. As a rule under a strong government they are orderly and law-abiding, but they cannot resist their predatory instincts when, through laxity of government or favourable circumstances, they are able to plunder with impunity. In the more sparsely settled districts of the country gang robbery is a frequent source of trouble to the people and to the government. As a people they have a bad reputation also for cruelty and perfidy.

**MARIA DE' MEDICI**, the daughter of Francis I., grand-duke of Tuscany, and of the Archduchess Joan of Austria, was born in Florence in 1573, and was married in 1600 to Henry IV. of France. (The first OPERA was performed at Florence on this occasion, the "Euridice" of the composer PERU.) She was equally celebrated as Queen of France by the sister art, a long gallery in the Louvre being filled with enormous canvases in honour of her and Henri Quatre by the immortal Rubens. Her unhappy temper led her to quarrel with her husband, and subsequently with her son. At the death of her husband in 1610 she was named regent for her son (afterwards Louis XIII.), and attempted to retain the power she held. At last she took to plotting against the king's great minister Richelieu, and was imprisoned at Compiègne (1631). She escaped to Brussels, where her second son, the Duke of Orleans, joined her the next year. In 1639 she crossed to England, and sought a refuge with her daughter, Queen Henrietta, but was sent away by her son-in-law, Charles I., in 1641. She retired to Cologne and died there in some poverty in 1642.

**MARIA THERESA**, Archduchess of Austria, Queen of Hungary and Bohemia, and Empress of Germany, born in 1717, was the eldest daughter of Charles VI. of Austria, emperor of Germany. [See CHARLES VI.] In 1724, Charles, by the Pragmatic Sanction, regulated the order of succession in the family of Austria, declaring that, in default of male issue, his eldest daughter should be heiress of all the Austrian dominions, and her children after her.

In 1736 Maria Theresa married Francis of Lorraine, grand-duke of Tuscany. Upon the death of Charles VI. in 1740, the King of Prussia, the Elector of Bavaria, the Elector of Saxony, and the kings of France, Spain, and Sardinia, agreed to dismember the Austrian monarchy, to



parts of which each of those powers laid claim. Maria Theresa, in spite of these heavy odds, supported by the enthusiastic efforts of the Hungarians, to whom she appealed, made good her claim as their queen, but she lost heavily in other parts of her dominions. Frederick II. of Prussia took the whole of Silesia, and more than once had Bohemia almost in his grasp; Spain and Naples denuded her of all her great Italian possessions; and France, Bavaria, and Saxony each gained at the expense of the hereditary Austrian monarchy. England came to the help of the distressed queen. She drove the French and Bavarians out of her kingdom, and her wonderful courage and astuteness stood her in such stead that at the peace of Aix-la-Chapelle which ended the War of the Austrian Succession (1748), she had finally lost only Silesia and the Italian duchies. Meanwhile, in 1745, her husband had been elected Emperor of the Holy Roman Empire (Emperor of Germany), in succession to Charles VII. emperor and king of Bohemia. From 1756 to 1763 raged the terrible Seven Years' War which nearly ruined both Austria and Prussia, but this was the last danger of the empress. At the death of the Emperor Francis in 1765 her son Joseph was elected emperor as Joseph II. As she had done with her husband, so also with her son, she associated him outwardly in the government of her hereditary dominions, but really never let go the reins of office. In 1772 she joined in the partition of Poland with Prussia and Russia, a lasting disgrace to all three countries. Her political acts at home are worthy of record. She abolished the torture, commuted the services which the Bohemian peasants owed to their feudal superiors, put a stop to literary piracy, established a national system of education, and made several important reforms in the temporalities of the clergy. She suppressed the Jesuits in 1773. She will ever rank among illustrious women and the benefactors of mankind. She died at Vienna, 29th November, 1780. Marie Antoinette of France was one of her daughters.

**MARIANNE ISLANDS.** See LADRONÉ ISLANDS.

**MARIE ANTOINETTE**, Queen of France, born at Vienna, 2nd November, 1755, was the daughter of Francis of Lorraine, emperor of Germany, and of Maria Theresa of Austria. In May, 1770, she married Louis, the dauphin of France (grandson of Louis XV.), who in 1774 became king of France under the name of Louis XVI. When the Revolution began, Marie Antoinette was on the side of the more resolute aristocratic leaders, and would have opposed it vigorously. She was one of the advisers of the attempted flight of the king, which proved unsuccessful, and only served to excite the public animosity against her and her husband. During the various attacks made against the royal family, she showed great courage. No one who reads the old memoirs of those times could imagine that the giddy, flighty, extravagant queen, whose good name even was not always above suspicion, as is seen in the public reception of the affair of the DIAMOND NECKLACE, and at other times—though it may have been that the suspicions were without real foundation—would become the heroic sovereign, the tender mother, and the uncomplaining wife, one might almost say the sainted martyr of the Revolution. Neither history nor fiction shows a more startling and unexpected change than this. The queen who as a girl thought it not unquently to play romps and hide-and-seek with the gentlemen of the court in the gardens of Marly and Versailles, seems not the same woman who in a few short years faces the mob dauntlessly, with hair blanched white by many tribulations. The people were quick to penetrate the secret of the king's nullity which she so devotedly tried to guard; it was with her that Mirabeau and Danton intrigued, not with Louis; it was her rather than the king at whom the sansculottes raged, and whom they vainly sought to defile with insults. Her demeanour under the most trying circumstances never lost its dignity. After

the death of her husband, she seemed for a time forgotten in the prison of the Temple; but she was brought to trial before the revolutionary tribunal 14th October, 1793, found guilty, and condemned to death. In the presence of her judges, the burst of indignant maternal feeling with which she appealed to any mothers present, when an infamous and absurd charge was brought against her, overawed even her accusers.

On 16th October, 1793, she was removed in a common cart from the prison of the Conciergerie to the place of execution. On her way she was reviled and abused by the ferocious mob in the most unfeeling manner, but appeared heedless of their vociferations, and suffered death with firmness and composure. She was thirty-eight years of age, but owing to her sufferings she bore a much older appearance. She left one son, who died in prison (Louis XVII.), and a daughter, afterwards Duchess of Angoulême. See especially her attendant, Madame Campan's, *Memoirs* of her, an excellent edition of which appeared in an English dress in 1883.

**MARIE GALANTE**, an island in the Caribbean Sea, about 15 miles south of Guadeloupe, of circular form and about 14 miles in diameter, was discovered by Columbus in 1493, and received its name from that of his ship. It was first settled by the French in 1647. The surface is of moderate elevation, and rises gradually towards the north; the western coast is low. The soil is productive, and yields abundantly the several West Indian products. Population, about 14,000. It still belongs to France.

**MARIENBAD**, a favourite watering-place of Bohemia, situated in a beautiful triangular valley, 32 miles N.W. of Pillau, 2000 feet above the sea, in the midst of pine woods. It has a theatre, kurbau, and a Roman Catholic and an English church. Its chief baths are cold and saline, containing glauber salts. The Abbey of Fehls is 9 miles east, with a valuable library, but it is not otherwise interesting.

**MARIENWERDER**, a town of Germany, the capital of a government of the same name in West Prussia, is situated on the Liebe and the Little Nogat, 2 miles from the Vistula, over which there is a pontoon bridge 2700 feet in length. It has 9000 inhabitants. It has a cathedral, with a steeple 170 feet in height; schools of art and agriculture; and an hospital for blind soldiers. It is the seat of the provincial courts and the government offices. There are manufactories of woollens, hats, soap, and leather. The breweries and distilleries are very considerable. The town is one of the most beautiful and prosperous in West Prussia.

**MARIGNANO**, now called *Melegnano*, about 10 miles from Milan, was the site of the famous battle in 1515 where Francis I. of France won the Milanese from the Italians and Swiss. It was also the scene of a French victory over the Austrians, 8th July, 1859. The important treaty between Guelfs and Ghibellines in 1279 was signed at this place.

**MARIGOLD**, or **POT MARIGOLD**, is a flower (*Calendula officinalis*) belonging to the order COMPOSITÆ. The English name is simply Mary's Gold, while the botanical name, *Calendula*, is derived from the Calends, or first of every month, as different kinds blossom every month in the year. The marigold is an old inhabitant of our gardens, for it was introduced from its native haunts in the south of Europe in 1573. The florets were at one time used as a carminative, and are even still used in some parts of the country as an ingredient of soups. The fruits ("seeds") are much curved, with remarkable projections on the back. The French Marigold (*Tagetes patula*) and the African Marigold (*Tagetes erecta*) are both natives of Mexico, and were introduced at about the same time as the common marigold. The French marigold has become so thoroughly naturalized everywhere, that it has been sent home as a wild plant from the interior of the island of Timor. The scientific name dedicates the genus to a Tuscan deity,

**Tagetes.** The corn marigold is a species of *CHRYSANTHEMUM*, native in the British Isles. The Marsh Marigold (*Caltha palustris*) is very nearly allied to the buttercup; its leaves are simple and heart-shaped.

### MARINE INSURANCE. See INSURANCE.

### MARINER'S COMPASS. See COMPASS, MARINER'S.

**MARINES** are men embodied to serve as soldiers on board ships of war. Every man-of-war has a complement of marines, whose duties on board are chiefly of a military character. They mount guard, assist in the armed boat-service, and in shore operations they land with the rest of the naval brigade, being formed into battalions commanded by their own officers. In naval engagements they fire from the tops and decks, and assist in repelling boarders with the point of the bayonet. They take their share in the gun drill unless required for other military purposes, but they can be called upon for no naval work other than that of assisting on deck at manning ropes with the watch in which they are stationed.

The total strength of the marines is fixed at 13,000 men, who are divided into forty-eight companies of infantry and sixteen of artillery, the total cost of the entire corps being about £915,000. In organization, equipment, and training the infantry and artillery branches of the corps follow the same regulations as the line and the royal artillery respectively, with the exception that all marines are in addition trained in the working of naval guns. The men enlist for twelve years, with permission to those of good character only to re-engage to complete twenty-one years' service. Being thus a long-service force it is able to maintain a valuable body of old and experienced non-commissioned officers. The men are recruited by special parties and are sent to the depot near Deal, where those who reach the requisite standard are permitted to volunteer for the artillery. The officers are obtained from the pass-lists at the entrance examinations for Woolwich and Sandhurst, the successful candidates being at once gazetted to lieutenants on probation. The infantry officers are then trained under the military instructor of the corps at Gosport, while those for the artillery spend two years under instruction at the Naval College at Greenwich. The officers who pass the examinations at Greenwich are afterwards sent to the *Excellent*, where they qualify as gunnery and torpedo lieutenants, and then join their headquarters. Promotion is strictly by seniority in the lower grades, and by selection to the rank of lieutenant-colonel. In rank marine officers correspond with army officers of similar grades according to seniority; as a corps the marines take place between the 49th and 50th regiments of infantry of the line. The uniform is scarlet with blue facings. The motto of the corps is "Per mare per terram;" its title of "Royal" was granted in 1802 for its many and varied services during the war, and in 1827 the badge of a globe, surrounded by a laurel wreath, was granted to commemorate the services rendered at the siege of Belleisle, and the word "Gibraltar" to mark its share in the defence of that fortress. First raised somewhere about 1684 the marines were employed on active service at Cork in 1690, and since then they have been present in nearly all the engagements in which the navy has taken part. At the commencement of the present century they could reckon up 227 naval battles and seventy important operations on shore in which they had taken part, and during the first fifteen years of this century they added 142 naval actions and ninety-nine coast operations to this long list. Since then they have shared in nearly every engagement that has taken place on sea, and in most of the land operations in different parts of the world, maintaining everywhere their old reputation for discipline, steadiness, and bravery.

**MARINE-STORE DEALERS** are in law subjected to certain special restrictions, with a view of preventing the ready sale of stolen property. Thus they are bound,

under a penalty of £20, to have the words "Dealer in Marine Stores" with their name painted over their warehouse or shop in letters not less than 6 inches in length. They are required to keep books, in which the name and address of the persons from whom they purchase articles are to be entered with the price paid. They are forbidden to purchase certain articles from any person apparently under sixteen years of age, and they incur a penalty of £5 if they purchase lead in any quantity less than 1 cwt., or copper, brass, tin, pewter, German silver, or spelter in any quantity less than 56 lbs.

### MARINUS (Popes). See MARTIN.

**MARIO**, the *nom de guerre* of the Marquis Giovanni di Caudia, was the most famous tenor singer in Europe for over a quarter of a century. He studied at the Paris Conservatoire, and made his *début* in "Robert le Diable" on 2nd December, 1838, obtaining at once the greatest triumph then known. He passed to the Italian opera in about a year. In 1839 he appeared in London in "Lucrezia Borgia," and at once made his fame in England. Thenceforward he sang season after season at London and Paris (the one season being in the summer and the other in the winter), always associated with Grisi, whom he afterwards married, and for many years also with Tamburini and Lablache. By about 1845 he had attained his unrivalled position. His singing was superb, while his acting and his exquisite taste in costume and every accessory of the stage were fully as great. In 1867 he retired, and after 1871 he did not sing at all, even in private. His total performances in opera are found to have been 931, of which 119 are in his great character Raoul in "Les Huguenots," and 102 in his equally great character of Almaziva in the "Barber of Seville." He lived with his family in Rome from 1873 onward. In 1879 some financial mishaps ruined the marquis, and he was seriously in want. A concert in London was at once organized, and sufficient money was raised to enable him to live in moderate comfort for the rest of his days, with the assistance of a small public post which was conferred upon him. He died at the close of 1883. In March, 1884, his coffin was taken to the family vault at Cagliari, Sardinia. Among the wreaths of flowers sent by old admirers of the great artist was one from the Queen of England. The friendship of Mario with Cavour and La Marmora, and the help he had generously given in his days of riches towards the cause of the liberation of Italy, were the themes of many grateful orators.

**MARIONETTES** are little figures of men and women, made of either wood or cardboard, and moved by means of cords or springs on the stage of what are called marionette theatres. The person who moves them is concealed from the audience, and alters his voice to suit the different figures, thereby producing a mimic dramatic entertainment. The amusement was known to the ancient Greeks and Romans, and in France and Italy is still practised.

**MARIOTTE'S LAW**, so called from its discoverer, Edme Mariotte, who died in 1684. It may be defined, in pneumatics, as a general property of elastic fluids—viz. that the elastic force is inversely proportional to the space which the fluid occupies. This principle, however, had been previously set forth by our own countryman, Boyle, in 1668, but it does not appear that the work in which he announced it was known to Mariotte, nor does Boyle express it with the same lucidity and certainty.

### MAR'ITIME LAW. See SHIPS.

**MARITZBURG** or **PIETER-MARITZBURG**, a town of South Africa, and the capital of the British colony of Natal, is built upon a terrace 2000 feet above the level of the sea and 52 miles distant from it. It consists of a few straight wide streets, which look picturesque at a distance, from the trees with which they are planted. It is without public buildings, and the official residences are of

the most unassuming character. There is a missionary college. It has a considerable trade in the produce of the country, and there is railway connection with Durban and Port Natal. The population is 7000. The name is compounded of those of two Boer leaders, Pieter Retief and Gert Maritz.

**MARIUS, CAIUS**, seven times consul of Rome, was born of humble parents at Arpinum, about B.C. 157. He served at the siege of Numantia, B.C. 134, under Scipio Africanus, together with Jugurtha, where he highly distinguished himself. In B.C. 119 he was elected tribune of the plebeians, in which office he showed himself a most determined enemy to the patrician order. He obtained the praetorship with difficulty, in consequence of the opposition of the patricians, who accused him of having used bribery. Marius married Julia, an aunt of Julius Cæsar.

In B.C. 109 he accompanied Metellus into Africa in the capacity of *legatus* (second in command); and by his prudence and courage in the war with Jugurtha he added greatly to his military reputation. His friends at Rome persuaded the people that the war with Jugurtha would never be concluded until the command was given to Marius. Metellus with some difficulty allowed his lieutenant leave of absence to go to Rome in order to stand for the consulship. Marius obtained that dignity (B.C. 107) and the direction of the Jugurthine War. In the following year (B.C. 106) he obtained possession of Jugurtha, who was treacherously given up by Bocchus to his quaestor Sulla. See JUGURTHA.

The news of the defeat of the Consul Manilius and the Proconsul Cæpio by the Teutones and Cimbri (B.C. 105) caused the greatest consternation at Rome, and Marius was elected consul during his absence in Africa. He entered upon his second consulship B.C. 104, and was again chosen consul in the two following years (B.C. 103, 102), the dreaded enemies being expected at any moment to return from their raid into Spain, and Marius being the only leader who was held capable of meeting the shock of their onslaught whenever it should at last come upon Italy. In his fourth consulship (B.C. 102), he defeated the Teutones and Ambrones, near Aquæ Sextiæ (*Aix*) in Gaul; and in the following year, B.C. 101, having been re-elected for the fifth time, joined his forces with those of Catullus, and entirely defeated the Cimbri in the plain of Vercellæ (Verocelli), situated to the north of the Po.

Marius was once more a candidate for the consulship for the following year; but the fear of the Gallic invasion was removed, and he was opposed by the patrician party. He nevertheless obtained the dignity, in great part owing to the exertions of Saturninus, the tribune. At the expiration of his consulship he left Rome; but in B.C. 90 the Marian or Social War broke out, in which Marius and Sulla were engaged as legati to the two consuls. But disgusted, it is said, with the increasing reputation of Sulla, Marius resigned his command before the conclusion of hostilities.

The Marian struggle had scarcely been brought to an end, before a war broke out between these two great rivals. The conduct of the Mithradatic campaign had been assigned to Sulla, who was now consul (B.C. 88); but his opponent used every effort to wrest it from him. He was warmly supported by P. Sulpicius, the tribune, and a law was passed in the assembly of the people that the command should be taken from Sulla and given to their old favourite Marius. Sulla was with the army at the time besieging Nola; but as soon as he heard of the law, he determined to resist so unjust a decree, gathered his forces, marched on Rome, and Marius and his adherents were obliged to quit the city. Marius escaped with the greatest difficulty to Africa, at one time being taken prisoner, and actually preserved from assassination only by his terrible look and the awe that clung around him and struck his executioner

motionless; but in the following year (B.C. 87), when Sulla had gone to Greece to oppose Archelaus, Marius returned to Italy, and joined the Consul Cinna, who had been driven from Rome by his colleague in the consulship and by the patrician party. Marius and Cinna, with the assistance of Carbo, blockaded the city, and as soon as they got possession of it, a general massacre of the opposite party ensued. All the leaders of the patrician party who were unable to escape from Rome were put to death. This fearful massacre began the agony and death struggle of the republic. Marius and Cinna declared themselves consuls for B.C. 86, without holding the comitia; but Marius died in the beginning of the year.

**MARIVAUD, PIERRE CARLET DE CHAMBLAIN DE** (really plain *Pierre Carlet* only), was born at Paris, in 1688. He wrote some dramas, but his celebrity rests upon his clever romances. Of these the greatest is "*Marianne*," which is the origin of our Richardson's "*Pamela*." This procured Marivaux a seat in the Academy in 1742. He was the first to attempt analysis of character in a novel with any set purpose and effect. He died at Paris in 1763.

**MARJORAM** (*Origanum*) is a genus of plants belonging to the order LABIATÆ. They are aromatic herbs, and some of the species are used medicinally and for seasoning purposes. Common Marjoram (*Origanum vulgare*) is a native of the British Isles, Europe, and Western Asia, as far as India. This species, together with the cultivated Sweet Marjoram (*Origanum Majorana*), was used by the Greeks both internally and in fomentations, as an antidote to narcotic poisons. Before the use of hops in beer, marjoram was employed as well as ground ivy, and even now it is used to give a flavour to table beer. Minute oil vesicles may be seen in the leaf, and, on distillation, oil of marjoram collects in the still, which differs from oil of thyme in its bright yellow colour and its perfume, which is more like that of peppermint.

**MARK**, the system of tenure of land among the ancient Teutonic peoples, including the English. Long before the Norman Conquest, however, there was in England a gradual verging towards feudal tenure, so that the feudal system was introduced here without any very striking revolution by William the Conqueror.

The mark system considered the whole mark (or *march*) or community as one great occupier of the tract of land which supported it. The *meare* (Old English) was strictly, according to the derivation of the word, the "border" of this land (compare the Latin *marka*, and other like words in kindred languages), but was used for its whole surface. In ancient times, while yet the English lived on the Continent, and for some time after the conquest of Britain, the arable land of the mark belonging to the whole tribe was allotted annually, or in some cases triennially, to owners of homesteads to be tilled until the fallow time, and the pasture and waste land was held in common by all families. As agriculture improved the mark system became impossible; for a good farmer reaped no benefit as to favourable tenure over his less competent fellow markmen; and the English conquest, with its opportunities of fresh arrangements, gave occasion for a tolerably swift change. The system failed to take root, and in a comparatively brief time individual ownership of land was rather the rule than the exception in England. After a century or two the possession of land was actually essential to the rank of a freeman. Yet the mark system left its traces; thus the English township was a relic of the mark itself, and the old custom of sowing a third of a farm with spring crops, a third with autumn crops, and letting a third lie fallow, pointed to the old division among the markmen, the kinship of the tribe, and their common *wer-gild* or blood-money payable by the whole for the crime of the one, &c

**MARK**, an old Teutonic name for a coin. The origin of the name would seem to be this: a *marca* (Old English) or *marca* (Old German) was a boundary, hence an outline, and hence any sign indicating that boundary or outline—a landmark, such as a post, a notch in a tree, &c. The word thus came to mean a mark in our modern sense, and so acquired the sense of a numerical unit, from which to the unit of coinage was an easy step.

The Old English mark was worth 13s. 4d., two-thirds of a pound (probably originally an actual pound troy of silver). The Old German (Cologne) mark was originally half a pound (16 oz., the Old Cologne pound being 32 oz.) of silver, and this from 1750 was coined by Prussia into fourteen thalers, and by Austria into twenty gulder. An old Scottish coin, value 1s. 1½d., was called also mark.

The term is now used for current coinage as follows. The most important current mark is that of the Empire of Germany, created by the laws of December, 1871, and July, 1873. Its value is determined by the weight of the gold 20-mark piece, the double crown; by the half this, or crown; and by the silver mark. The double crown (twenty marks) weighs 7·965 grammes (122·88 grains), and is 900 fine, which gives the mark in gold as worth exactly 11½d. (The silver mark weighs 5·555 grammes, and is also 900 fine, which gives the value as about 10½d., and is to be regarded rather as a token than a coin of full value.) It certainly is a thousand pities that the German government did not make the double crown exactly equal to the English sovereign, and the mark to the English shilling, while they were changing. The mark is subdivided into 100 pfennige, so that accounts are kept on the decimal system. The old thaler is considered as worth three marks.

The Danish mark is a sixth of the rigsdaler, equal to 16 skilling or 4½d. English; and the Norwegian mark is a fifth of the species daler or ort, and equal to 10½d.; but both these coins are being displaced by the money of the Scandinavian Monetary Convention of 1873.

The old Mecklenburg silver mark, equal to 1s. 2d. English, and the famous old Hamburg mark, 1s. 1½d. English, are also doomed to disappear, though yet fairly in circulation; and the same applies to the Lübeck mark, value 1s. 1½d.

The Finland mark is measured by the gold 10-mark piece of 3·226 grammes, 900 fine, giving a value for the single mark of 9½d. sterling, almost exactly the franc, lira, drachma, &c., of the great Latin Monetary Convention. The silver mark is of almost identical value. The mark is divided into 100 penni, a Finland penni being equal exactly to a French centime.

**MARK ANTONY.** See ANTONIUS, MARCUS.

**MARK BANCO**, a curious monetary unit of Hamburg and the Hanse towns, even yet in very constant use. The Hamburg bank, in taking silver ingots, gives credit for the fine silver they contain at the rate of 27½ marks banco for 3600 troy grains, or one fine Cologne mark. The mark banco is thus equal to very nearly 1s. 6d. English. As these credits represent absolute metal, not liable to abrasion and all the accidents of coinage, they are transferred from one bank to another in preference to the actual coin. Those who are used to the system greatly prefer it, but it is very puzzling to foreigners. The other mark, or absolute coinage, is called the *mark courant*, in contradistinction to the mark banco.

**MARK, ST.** Mark the Evangelist is identified by most scholars with the John Mark and the Mark of the Acts and Epistles of Paul and Peter, and this view is almost unanimously supported by patristic and mediæval tradition. The existence of two or even three separate persons called by this name, and mentioned in the New Testament, has been assumed by some recent critics in order to support their theories as to the origin of the different books, but no really valid reason has been advanced

in support of their theories. Accepting the view first mentioned as correct, Mark was the son of a certain Mary who lived at Jerusalem, and was a cousin of Barnabas. It was to the house of Mary, the mother of Mark, that Peter went after his miraculous deliverance from prison. Mark accompanied Paul and Barnabas on their first missionary journey as far as Perga in Pamphylia, where he parted from them and returned to Jerusalem. Paul seems to have regarded this withdrawal unfavourably, for when at a later period Barnabas proposed taking him with them again he objected, and a contention arose which resulted in their parting company. Mark accompanied Barnabas to Cyprus, but he was afterwards reconciled to Paul, for we find him subsequently at Rome with that apostle during his first imprisonment (Col. iv. 10; Philemon 24). At a later period he was at Babylon (or Rome) with Peter, and in 1 Peter v. 13 he is referred to as "Mark, my son," a phrase generally interpreted to mean that he was a convert of Peter. Still later he is mentioned favourably by Paul (2 Tim. iv. 11), and this is the latest authentic reference we have to him. According to some very primitive traditions Mark travelled for a long time with Peter, and by taking down the words of his discourses he compiled his Gospel, which after its composition was approved by Peter. He is said to have been sent on a mission to Egypt, and to have founded a church at Alexandria, of which he became the first bishop. The Copts of Egypt still claim him as the founder of their church in that country. There is another tradition to the effect that he also founded a church in North Italy, and it is on this account he is claimed as the patron saint of Venice. The oldest traditions speak of him as having died a natural death, but later accounts award him the honour of martyrdom, the mode of his death being variously stated. During the middle ages a belief was entertained that his remains had been removed from Alexandria to Venice, but this belief appears to have no trustworthy foundation, and it is accepted by very few modern scholars. In mediæval art Mark is represented with a lion, this being the symbol awarded to him by Jerome from the four living creatures of the Book of Ezekiel. For an account of the Gospel according to St. Mark see GOSPELS.

**MARKET**, a public place and fixed time for the meeting of buyers and sellers. A legal market can exist only by virtue of a charter from the crown or by immemorial usage, from which it will be presumed that a royal charter once existed, although it can be no longer produced. A market is usually granted to the owner of the soil in which it is appointed to be held, who, as such grantee, becomes the owner, or lord, of the market. In upland towns, that is, towns which, not being walled, had not attained the dignity of boroughs, markets were frequently granted to lords of manors; but in walled towns or boroughs, particularly in such as were incorporated, the ownership of the soil having usually (by grant from the crown, or other lords of whom the borough was originally holden) been vested in the incorporated burgesses, the practice has commonly been to grant markets to the municipal body.

Formerly markets were held chiefly on Sundays and holidays, for the convenience of dealers and customers, who were brought together for the purpose of hearing divine service. But in 1285, by 13 Edward I. c. 5, fairs and markets were forbidden to be held in churchyards; and in 1448, by 27 Henry VI. c. 5, all showing of goods and merchandise, except necessary victuals, in fairs and markets, was to cease on the great festivals of the church, and on all Sundays except the four Sundays in harvest. The holding of fairs and markets for any purpose on any Sunday was prohibited in 1677, by 29 Charles II. c. 7.

It is a rule of the common law (subject to some exceptions) that every sale in market-overt (open market) transfers to the buyer a complete property in the thing

sold; so that however defective the title of the vendor may be, that acquired by the vendee is perfect, even where the property belongs to a person who is under legal disability, as an infant, a married woman, an idiot, or a person in prison or beyond sea. Even stolen goods when they are purchased honestly in open market pass with an indefeasible title, except where the true owner prosecutes the thief and obtains a conviction, in which case the property reverts to him. In the city of London every shop is market-overt for goods usually sold there. The privilege of market-overt is unknown in the law of Scotland. When, therefore, goods have been sold in open market by one who has stolen them, or by a person to whom they have been lent, the owner may recover them from the purchaser. But corn subject to the landlord's hypothec, if sold in bulk in market-overt, is secured to the purchaser against the operation of the hypothec.

A market is generally appointed to be held once, twice, or three times in a week, for the current supply of commodities, mostly of provisions. A large market held once or twice a year is called a fair; and, according to Lord Coke, a large fair held once a year is a mart.

Fairs have all the legal incidents of markets, and are subjected to further regulations by 2 Edward III. c. 15, one of which requires that at the opening of the fair proclamation be made of the time that it is to continue.

In Scotland the right to hold markets or fairs is vested in the crown, and no person or burgh can exercise it without a crown grant either express or by prescription. What toll or custom is leviable depends on statute or immemorial usage.

**MARKET-HARBOROUGH**, a market-town of England, in the county and 14 miles south-east of Leicester, and 81½ from London by the Midland line. It stands on the north bank of the Welland, and has a Gothic church, a town-hall, a very convenient large corn exchange, and considerable manufactures of carpets and tanneries. Market-Harborough was the headquarters of Charles I. before his defeat at Naseby. The population in 1881 was 5351.

**MARKING-NUT TREE** (*Semecarpus Anacardium*) is a tree belonging to the order ANACARDIACEÆ. It is a native of India. Its unripe fruit is employed for making a kind of ink, or, when pounded, a species of birdlime. The fleshy receptacle of the ripe fruit is yellow in colour. The natives eat it roasted. A bitter corrosive juice is yielded by the hard shell, which, when mixed with quicklime, serves as an indelible marking ink for linen or cotton; or, when dry, it may be used as a thick black varnish, mixed with pitch and tar, for caulking ships. This juice is very efficacious in removing warts. The seeds, called Malacca-beans, or Marsh-nuts, are eaten, and they are said to quicken the faculties of the mind. They supply an oil used in painting.

**MARL** (Dutch, *marghel*, from *margh*, marrow, i.e., to fatten or enrich land), an earthy substance found at various depths under the soil, and extensively used for the improvement of land. It consists of calcareous and argillaceous earth in various proportions, and as the former or the latter prevails, so it is beneficially employed on clays or sands. There are several distinct sorts of marl—clay marl, shell marl, slate marl, and stone marl. The effect of marl is the same as that of clay and chalk upon sandy soils; on heavy soils its effect is proportioned to the quantity of calcareous earth which it contains. The peculiar advantage of marl is its readily crumbling to powder by the effect of air and moisture.

Marl is often found very near the surface, so as to mix with the soil in ploughing; but unless there be a sufficient depth of soil above, its presence does not indicate great fertility. It is generally best when found at a moderate depth, so as to be readily dug out and carted on the adjacent lands. Marl, when put fresh upon the land, requires some time in order to become effective. It should there-

fore be laid on the surface and spread before winter, leaving it there for a considerable time before it is ploughed in. It is most advantageous to put it on the land when it is in grass, and to roll and harrow it repeatedly, in order to expose it to the effect of the air and rains. Alternate frosts and thaws greatly assist its pulverization.

An excellent use of marl is in forming composts with dung and peat earth. It is laid in layers with the dung and peat, and if the heap is well soiled with urine or the washings of stable-yards, it will in a short time become a most valuable manure for all kinds of soils.

Marl was in common use in England as a manure as early as the thirteenth century, and an Act passed in 1225 gave every man a right to sink a marl pit on his own land. Of late years lime has been often used instead of marl, as, owing to its bulkiness, the latter can only be used in the neighbourhood in which it is found.

Marl, in all its forms, is a calcareous clay, and in most cases is produced by the denudation of limestone rocks and deposition of the debris. *Shell marl* is a variety found in many lakes; it is produced from the shells of freshwater gasteropods.

**MARLBOROUGH**, a town and municipal borough of England, in the county of Wilts, situated on the Kennet. The town consists chiefly of one spacious street lined with houses irregularly built, the modern ones being of brick or stone, the older ones of timber, with quaintly carved fronts. The market-house is an ancient building, having in its upper storey a council-chamber, assembly-rooms, and court house. There are two churches; St. Mary's, an old building, with a tower at the west end, and a Norman doorway; and St. Peter's, with a lofty square tower. The latter church was restored in 1863. Marlborough also contains several dissenting chapels, a free grammar-school, and various charities. The trade in malting, brewing, corn, coal, bacon, butter, and cheese, and rope and sack-making manufactures, are in a prosperous condition. In 1843 a college was founded for sons of the clergy, which has become a flourishing public school, and educates between 500 and 600 boys. The building is handsome in design, and occupies the site of an ancient castle, where, in the reign of Henry III., was held the Parliament whose enactments were known as the Statutes of Marlbridge. The town gave the title of duke to the great victor of Blenheim and Ramilies. Near it is the celebrated Druidical monument similar to Stonehenge. [See AVERBURY.] The municipal borough is governed by four aldermen (of whom one is mayor) and twelve councillors. The population in 1881 was 3843. Marlborough was formerly a parliamentary borough, and returned two members to the House of Commons prior to 1867. It was then deprived of one, and lost the other under the Redistribution of Seats Act of 1885.

**MARLBOROUGH, JOHN CHURCHILL, DUKE OF**, was born at Ashe, in Devonshire, on the 5th of July, 1650, of an old cavalier family which had suffered much in the Civil War for its attachment to the royal cause. After receiving the rudiments of education from a Devonshire clergyman, and a brief course of tuition at St. Paul's School, London, he procured, through the influence of his sister Arabella, a mistress of James, duke of York (James II.), a pair of colours in a regiment of foot-guards at the early age of sixteen. Having entered into an amorous intrigue with the Duchess of Cleveland, one of the mistresses of Charles II., he was rewarded by her with the sum of £5000, which he at once invested in the purchase of an annuity. At Tangier, in 1666, he greatly distinguished himself; but his eminent abilities were more fully displayed in the campaigns of 1672-77, in Holland, where he commanded a company in the Duke of Monmouth's division of the allied army, and studied the art of war under Condé, Vauban, and Turenne. At Maastricht he saved the life of the Duke of Monmouth, and for his eminent gallantry received the

public thanks of Louis XIV., as well as promotion to a lieutenant-colonelcy from his own sovereign.

Early in 1678 he was married to Sarah Jennings, the confidential attendant of the Princess Anne, a woman of great beauty and considerable mental powers, whose influence over her husband remained unimpaired to the last. He was now attached to the service of the Duke of York; was created Baron Churchill, of Eymouth, in Scotland; and, in 1683, appointed colonel of a newly raised regiment of dragoons. On his patron coming to the throne the fortunate soldier was loaded with additional favours: he was made an English peer, promoted to the rank of brigadier-general, and despatched to Paris to notify the accession of the new monarch, and to thank the French king for the gift of money which so basely inaugurated the English sovereign's foreign policy.

When at the accession of the unpopular James II., Monmouth, his popular nephew (illegitimate), commenced his abortive rebellion, Churchill was created major-general, and appointed second in command to the Earl of Feversham. His skill and energy saved the royal army from a surprise on the eve of the battle of Sedgemoor, and largely contributed to the victory won upon that sanguinary field. For these services he received the colonelcy of the 3rd regiment of Horse Guards.

Churchill was therefore bound to James II. by the strongest ties of personal gratitude; but that monarch's designs against the Protestant religion and the freedom of England excited his disapprobation, and he secretly joined the powerful party which invited William of Orange to seize upon the English crown. But he did not do what, as an honest man, he should have done, retire from the service of the sovereign whose conduct he disapproved. While he carried on a clandestine correspondence with the Dutch prince, he accepted the command of a corps of 6000 men destined by James II. to oppose his progress, and accepted a lieutenant-generalship in the army which he intended to deliver up to his rival. And not only did he desert his generous master, but his influence and that of his wife secured the desertion of that master's daughter; so that the heaviest blows inflicted upon James fell from the hand of the man whom he had loaded with the greatest favours. Such treachery can hardly be palliated by the fact, that in this respect Churchill was neither better nor worse than most of his contemporaries.

William III. duly rewarded Churchill for these important services. He received the earldom of Marlborough, and was named lieutenant-general of the army. Soon afterwards he was appointed to the command of the British auxiliary force in the Netherlands, and earned a warm eulogium from King William. "I am very happy," wrote the king, "that my troops behaved so well in the affair of Walcourt. It is to you that this advantage is principally owing." He served in Ireland in 1699 with equal distinction. In thirty-seven days he reduced Cork and Kinsale, and confined the war to the province of Ulster. But from motives which it is unnecessary to elucidate—partly, perhaps, from his jealousy of the confidence which the king bestowed on his Dutch favourites, partly from a fear that some new revolution might recall James II. to the throne—he kept up a clandestine correspondence with the exiled monarch, and betrayed the secrets of his sovereign's councils. The thoroughly unscrupulous character of the man is shown in the fact that the British expedition against Brest was betrayed by him, a circumstance which led to its defeat with much slaughter and the death of its commander. His treachery becoming known to William, he was deprived of all his commands, and thrown into the Tower. But so great was his influence that he soon obtained his release, and the king did not dare to bring him to trial. After living for some years in privacy he gradually recovered his place in the royal favour, was restored to his seat in the

privy council, and named preceptor of the young Duke of Gloucester, the son of the Princess Anne, and heir-presumptive to the throne. "My lord," said the king, "make my nephew to resemble yourself, and he will be everything which I can desire."

In 1701 broke out the War of Succession, which soon involved all Europe in the flames of battle. Marlborough was now summoned to a scene peculiarly adapted for the display of his consummate genius, and called upon to play a part in which the severest critic can but regard him with admiration. On the 1st of June, 1701, he was named ambassador-extraordinary to the Hague and commander-in-chief of the allied forces in Flanders; an appointment which, as far as England was concerned, virtually invested him with the general direction of affairs, both civil and military, and strikingly showed the high estimate which William had formed of his ability as a diplomatist and his genius as a soldier. But while vigorously urging on preparations for the conduct of the war, William's career was suddenly terminated, and the Princess Anne succeeded to the throne. She immediately confirmed the appointments of her predecessor, and showered additional favours on her favourite and her favourite's husband. The earl received the Order of the Garter, and the countess was made Mistress of the Robes and Keeper of the Privy Purse. Thus distinguished by special marks of his sovereign's confidence, Marlborough repaired to the Continent, and entered upon that career of glory which has secured him a place among England's foremost generals and statesmen.

In judging Marlborough's military career, the reader must remember that he was constantly hampered by the jealous interference and parsimony of the Dutch government, alive only to its own interests, and incapable of comprehending any grand scheme of European policy; and that he was frequently fettered by the intrigues of political parties at home. Over every obstacle, however, his genius triumphed, and to Marlborough alone is due the glory of having rescued Europe from French supremacy.

The campaign of 1703 was illustrated by numerous successes, and Warbor, Stevenswaert, Rurmond, and Liège fell before the allied armies. In the following year, by a succession of masterly movements, Marlborough (who had now been elevated to a dukedom) diverted the war from the borders of Holland to the valley of the Danube, and prevented the combination, designed by Louis XIV., of three great French armies to overwhelm at one blow the inferior forces of the allies. After forcing the passage of the Danube beneath the guns of Schullenberg, a feat of the most brilliant daring, he encountered Marshal Tallard and the Elector of Bavaria near the village of Blindheim or Blenheim, on the 18th of August, 1704, and inflicted upon them a crushing defeat, the total loss of the French and Bavarians being not less than 40,000 men. The ultimate result was the destruction of that vast fabric of power which Louis XIV., aided by the talents of Turenne and Vauban, had laboured so long to construct. Marlborough, on his return to England, was received with an enthusiastic welcome, and an Act of Parliament bestowed upon him the royal demesnes of Wootton and Woodstock, and decreed the erection of a splendid mansion at the national expense. In May, 1706, the great battle of Ramilies was fought, and the year 1708 was rendered famous by the victory of Oudenarde (11th July), which crushed the army of Vendôme. The following year, on the 11th of September, he fought the sanguinary but indecisive battle of Malplaquet, in some respects the most extraordinary of his achievements. This was the last of his great victories, and though he continued in command of the forces during the campaigns of 1710 and 1711 his fall was already resolved on. The nation had grown weary of the war, and the queen had thrown off the dictation of the Duchess of Marlborough, which had at last become intolerable. In April, 1710, the definite

rupture between Anne and the duchess occurred, and in the August of that year the Whig ministry was dismissed during the absence of Marlborough on the Continent. For a time he clung, in spite of humiliations, to his command and various lucrative offices, but on the 1st of January, 1712, he was deprived of them all. Later in the year a mysterious interview with the prime minister Harley was followed by his removal to the Continent, where he remained until the death of Anne. Immediately after that event he returned to England (August, 1714), and received from George I. the appointments of Captain-general of the Army and Master of the Ordnance. His last professional service was to plan the details of the campaign of 1715-16 against the rebels in Scotland, but he did not in person take the field. The deaths of two of his daughters at short intervals were severe blows to his already weakened frame. On the 28th of May, 1716, he was seized with a severe paralytic fit, and the attack was repeated in November of the same year. He partially recovered from their effects, and occasionally attended in his place in the House of Lords up to the 17th of November, 1721. In the following June he was prostrated by paralysis for the third time, and after lingering a few days, expired on the 16th of June, 1722. He left an only daughter, who was permitted to wear the title in her own right. She was exceedingly eccentric, and her name is much linked with that of the poet CONGREVE. The present ducal family is very distantly related to the great duke.

Although Marlborough left the military art as he found it, and can be credited with no improvement in the science of war, he possessed consummate ability as a commander, and must certainly be regarded as the greatest general England has hitherto produced. As a diplomatist and statesman also he takes high rank, and throughout his career he was always distinguished by courage, coolness, and urbanity. Unhappily his avarice and selfishness were as great as his talents, and few men have ever sunk to such depths of meanness and treachery as John Churchill, first duke of Marlborough. (See Coxé, "Life of Marlborough;" Lediard's "Life;" Alison's "Military Life;" Sir G. Murray's "Letters and Despatches;" Dumont's "Military History;" Milner's "Journal of Marlborough's Campaigns;" Macaulay's "History of England;" and "Letters of Sarah, Duchess of Marlborough," London, 1875.)

**MAR'LOW.** See GREAT MARLOW.

**MAR'LOWE, CHRISTOPHER**, the only dramatist who is at all dimly comparable with Shakspeare (except in comic power, which is curiously absent), was born, according to Malone, in 1565. He was entered of Benet, now Corpus, College, Cambridge, took his bachelor of arts degree in 1588, and that of master of arts in 1587. On leaving the university he became a dramatic writer and perhaps an actor. His moral character appears to have been bad, and he was slain by a low companion in a tavern brawl.

The following plays are attributed to him:—"Dr. Faustus," "Edward the Second," "The Jew of Malta," "Tamburlaine the Great," "Lust's Dominion," "The Massacre at Paris," and "Dido, Queen of Carthage."

To Marlowe we are indebted for the first regular form of the English drama cleared of rhymes; and he may be considered as the link between the Moralities and Shakspeare. Though in age a contemporary of Shakspeare's, Marlowe died before Shakspeare had produced a single great play. His style has been aptly characterized by Ben Jonson as "Marlowe's mighty line," and he frequently attains a high standard of poetical expression. Besides his plays, Marlowe translated Ovid's "Art of Love" (which one wishes on all accounts he had left alone). His "Hero and Leander" is a perfectly magnificent poem, though its unrestrained descriptions are not to modern taste. The passage beginning

"Who ever loved that loved not at first sight,"

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would of itself make Marlowe immortal. Another famous poem, though a short one, is "Come live with me and be my Love," favoured of musicians in all time. It has been well said of Marlowe that he is a poet's poet. Charles Lamb and Hazlitt rightly go into ecstasies over the death scene of Edward II. Swinburne declares, "If all the pens that poets ever held had fed the feeling of their master's thoughts," Marlowe would not be over praised. A splendid edition in thirteen volumes, quite complete, and with a masterly preface, was brought out by Mr. Bullen in 1885, superseding all other presentations of the poet's works.

**MARLSTONE** is an alternative name for the Middle Lias. This formation is argillaceous below, but passes upwards into ferruginous sandstone and limestone. It is rich in fossil remains, and contains the peculiar brachiopod *Spirifer Walcottii*, one of the last representatives of a Palæozoic genus. When this formation crops out it forms a marked feature; the beds, both above and below, being comparatively soft are worn away, leaving the marlstone as a prominent escarpment.

**MAR'MALADE**, a sort of preserve made with sugar and the Seville or bitter orange, a variety of the fruit of the *Citrus Bigaradia*. It is more wholesome when properly made, i.e. when the rind is soft, than most other sweet preserves, as the bitter communicates tonic and stomachic properties to it.

**MAR'MARA or MAR'MORA, SEA OF**, the *Propontis* of the ancients, is situated between the Grecian Archipelago and the Black Sea, communicating with the former by the Dardanelles, the ancient *Hellespont*, and with the latter by the Strait of Constantinople, the ancient *Bosphorus*. Its extreme length, from west to east, including the Gulf of Ismid, is 172 miles, and its greatest breadth is 55. The sea is very deep. There are no tides, but a current sets in from the Bosphorus. The island of Marmora, from which the sea derives its name, is situated near its western extremity, and is celebrated for its white marble.

**MARMONT, AUGUSTE FRÉDÉRIC LOUIS VIESSE DE**, Duke of Ragusa and Marshal of France, was born at Chatillon-sur-Seine, 20th July, 1774. He entered the army at an early age, was present at the siege of Toulon in 1793, was made captain in 1794, and accompanied Bonaparte to Italy and Egypt, where he was made general of brigade. He returned to France with Bonaparte and assisted him at the revolution of the 18th Brumaire. At the great battle of Marengo he directed the artillery, and was at once made general of division. In 1806 he commanded the army in Dalmatia, and for his victory over the Russians at Castel-Nuovo was created Duke of Ragusa. In 1809 he was called to the help of Napoleon, who was closely beset in the island of Lobau, and joined the main army the day before the battle of Wagram. After Wagram he gained the decisive victory of Zuzaim, and was rewarded with a marshal's baton. He was then appointed governor of the Illyrian provinces, but in 1810 was hastily summoned to Paris, and sent to succeed Massena in the command of the French army of Portugal. Here he assumed the offensive, raised the siege of Badajoz, and held Wellington in check for fifteen months. He encountered the latter commander, 22nd July, 1812, at the great battle of Salamanca, and met with a crushing defeat, being also severely wounded in the action. In the campaign of 1813 he commanded a *corps d'armée*, and was present at Bautzen, Dresden, and Leipzig. In the retreat towards Paris in 1814 he was present in almost every engagement, but ultimately (though not until every hope was lost, and all that was left was the ability to prevent the useless massacre of the garrison of Paris) he entered into treaty with the allies and assisted to restore the Bourbons, by whom he was loaded with honours. He remained faithful to them during the Hundred Days, and followed Louis XVIII. to Ghent. After the second



restoration he was made a peer of France and a major-general of the royal guard, but his desertion of Napoleon was not forgotten, and he was never trusted or popular. When the revolution of 1830 broke out he endeavoured for a time to suppress it, but afterwards gave way and allowed it to take its course. He accompanied Charles X. to England, and from that time resided chiefly in Vienna. During the later years of his life he published several works, but the most important of his writings are his "Mémoires," which did not appear until after his death. He died at Venice, 2nd March, 1852.

**MARMONTEL, JEAN FRANÇOIS**, a distinguished French man of letters, was born at Bort in Limousin, 11th July, 1723. He was educated at the Jesuit college in Mautais, and by the invitation of Voltaire came to Paris in 1745, where he endeavoured to support himself by literary work. Voltaire introduced him to several persons of distinction and helped to procure a sale for his poems, and in 1753, by the favour of Madame Pompadour, he was appointed clerk of public buildings, and was afterwards made editor of the *Mercur*. He had already published numerous tragedies, operas, heroic poems, and odes, and he now composed for the *Mercur* his celebrated "Contes Moraux," which were afterwards published separately. He contributed to the *Encyclopédie* a series of articles on poetry and general literature, which he afterwards issued in a book form in 1787, under the title of "Éléments de Littérature." This is perhaps his best book, and it is still ranked among the higher French classics. His "Bélisaire," which appeared in 1767, is chiefly famous on account of its chapter on toleration, which aroused the wrath of the Sorbonne, and gave rise to a controversy between the priests and theologians on the one hand, and the philosophers and wits on the other, the victory remaining with the latter. He was a member of the electoral assembly of Paris in 1789, but hid himself during the Reign of Terror in the country. During his retirement he composed his very interesting "Mémoires," which comprise a literary history extending over two reigns. He died at Ablonville, 31st December, 1799.

**MAR MOSET** (*Haplorhina*) is a small family of monkeys confined to Central and South America. With the exception of the lemurs, which are by some considered to form a separate order, the marmosets form the lowest division of the order Primates, under the name *Arctopithecini*. The marmosets are all of small size, rarely exceeding that of a squirrel, to which in form and agility they present some resemblance. All the digits have sharp claws, except the first on the hind foot (hallux), which has a broad nail: the first digit of the fore foot (pollex or thumb) is not capable of being separated widely from the other digits. The teeth agree in number with those of man and the higher apes, but there are only two molars on each side in each jaw, while there are three premolars, as in the American monkeys. The tail is long and bushy, but never prehensile. The body is covered with soft woolly fur. The head is small and rounded, and the ears are usually provided with tufts of hair. The brain is well developed, and the cerebral lobes cover all the other parts, but they are almost entirely destitute of convolutions.

In their native regions, the luxuriant forests of South America, the marmosets live among the trees in small troops displaying considerable activity. They feed on insects, small birds and their eggs, fruits, &c. These little monkeys, though not remarkable for intelligence, still from their beauty, liveliness, and affectionate disposition, are frequently kept as pets. Indeed there is no doubt that in the sixteenth, seventeenth, and eighteenth centuries they were the favourite companions of the most fashionable ladies of Europe, and probably had even more tenderness lavished upon them than is bestowed upon the lap-dogs of the present day. We find the word marmoset applied to young

children as a term of endearment by several writers of the last century. A remarkable indication of the early prevalence of the taste for having marmosets as pets, rendered more striking by the absurd anachronism involved in it, is furnished by the fact that Guido has introduced one of these animals into his picture of the "Abduction of Helen." They occasionally breed in captivity in England, bringing forth three at a birth.

The Common Marmoset (*Hapale jacchus*) or Quislti, a native of Brazil, is of an ash colour, with the rump barred with brown, and the tail variegated with darker and lighter rings; the head and back of the neck are of a reddish-brown colour, and on the sides of the head, both before and behind the ears, are numerous long hairs of a white colour. It measures about 8 inches in length, while its tail is nearly 11 inches long.

Some of the marmosets are placed in a distinct genus, *Midas*, which is characterized by having the lower incisor teeth short and broad, and the lower canines longer and larger than in *Hapale*. The marmosets of the genus *Midas* are commonly called Tamarins. One of the prettiest is the Silky Tamarin (*Midas marikina*), which is a beautiful little creature of a golden yellow colour, with the head

and shoulders covered with long hair, forming a sort of mane, which has obtained for it the name of the lion monkey from some authors. It occurs in several parts of South America, especially in Guiana, Brazil, and Peru, and, from the beauty of its silky fur, its gaiety, and gentleness, it was formerly one of the greatest favourites of all the marmosets. The tail is long and tufted at the tip. Like the other marmosets the tamarins live in troops among the lofty trees of the great tropical forests, and feed on birds, insects, and fruits. Several other species of marmosets are known.

**MAR MOT** (*Arctomys*) is a genus of RODENTIA, forming the type of the Arctomyiæ, a subfamily of the squirrel family Sciuridæ. The marmots are confined to the northern hemisphere, within which they are very widely distributed. They have a somewhat short and stumpy body, with a short hairy tail. The digit (pollex) corresponding to the human thumb is rudimentary, and furnished with a flat nail: the other digits on both fore and hind limbs have long powerful claws, adapted for burrowing. The cheek-pouches, which are found in the other members of the subfamily Arctomyiæ, are either entirely absent or quite rudimentary. The head is broad and flat above, and the ears are short. The incisor teeth are broad and powerful. The marmots usually live in societies, forming extensive burrows underground. At the approach of winter they lay up stores of food within their burrows, and pass the cold season in a state of torpidity. They feed on roots and leaves, and in the summer display considerable activity. The food, though sometimes eaten, is coarse, and the fur is of little value. About ten species are known.

The Alpine Marmot (*Arctomys marmota*) is a stout-built animal, measuring about 20 inches long, excluding the thick-set tail, which measures 6 inches more. It inhabits the loftiest slopes of the Alps, Pyrenees, and Carpathians, immediately beneath the snow-line. The fur has a yellowish-gray colour, becoming brownish-gray about the head. When alarmed these animals utter shrill cries. The Bobac (*Arctomys bobac*) is an inhabitant of the smaller hills of Eastern Europe and Siberia, extending all the way from Poland to Kamchatka; and is found in elevated situations in Cashmere, Tibet, and the Himalayas. The fur exhibits a yellowish-gray colour, the hairs about the head having a russet tint. It is about 15 inches in length, exclusive of the tail. The Wood Chuck (*Arctomys monax*) is a well-known native of the central districts of the United States, where it is regarded by farmers as a pest, since it proves very destructive to the crops of red clover. The habits of these animals are social and diurnal; for having



placed sentinels before their burrows, they wander forth in mid-day to commit their havoc. They are very prolific, the female producing six young at a birth. The fur of the adult is of a rusty gray colour. Two other species are peculiar to North America, one of which, the Whistler (*Arctomys prainosus*), is a very large species, the body measuring as much as 26 inches; it has a northerly range extending even into the Arctic circle. Two other genera are placed in the subfamily *Arctomyiina*, *Cynomys* (PRAIRIE DOG), and *Spermophilus* (SQUIRREL).

**MARNE**, a department in France, formed out of a portion of the province of Champagne, is bounded north by the departments of Aisne and Ardennes, east by those of Meuse and Haute-Marne, south by that of Aube, and west by Seine-et-Marne and Aisne. Its greatest length from north-east to south-west is 81 miles, from north-west to south-east 74 miles. The area is 3159 square miles, and the population in 1886 was 429,491.

**Surface, Soil, and Aspect.**—From the centre to the north of the department the arid and almost barren soil consists of a thin layer of sandy earth not 2 inches in depth, and resting on a chalk bottom. These sandy plains, formerly destitute of all vegetation, have been planted with Scotch pines. Between Rheims and Fismes the soil is good, and along the western border, and in the valley of the Marne, there is some strong deep land. Again in the Perthois district, in the south-east of the department, along a considerable margin from Vitry to Sainte Ménéhould, and in the valley of the Aisne, the soil is in general rich and productive.

**Rivers.**—The department takes its name from the river Marne (the *Matrona* of Julius Caesar), which rises in the department of Haute Marne, about 3 miles south from Langres, and flowing nearly north past St. Dizier, then sweeps round to the west, and enters the department of Marne; here its course is north-west past Vitry and as far as Châlons, whence it flows west, and continues in this general direction across the south of the department of Aisne, the north of Seine-et-Marne, and to its junction with the Seine at Charenton, in the department of Seine-et-Oise. Its whole length is 217 miles, of which 147 from St. Dizier to its mouth, are navigable. Its principal feeders on the right bank are the Rognon, the Saulx (which receives the Ornain), and the Ourcq; on the left bank the Blaise, the Collé, the Seme-Soude, the Grand Morin, and the Petit Morin. The Marne is connected with the Rhine by a canal. The north of the department is drained by the AISENE.

**Climate and Produce.**—The climate is temperate and the air pure, except along the eastern and western borders of the department, where in the low, rich, and sometimes marshy bottoms fogs are not unfrequent at certain seasons of the year.

The vine for the production of the famous Champagne wines is the chief object of the landholders' care all through the department, more especially in the arrondissement of Rheims and Épernay, wherein the white wines of Sillery, Aï, Mareuil, Pierry, Épernay, and Dizy, and the pink wines of Verzenay, Verzy, Bouzy, Taisy, Camières, Aï, Hautvillers, Mareuil, Dizy, and Pierry (all of the first class, differing and distinguishable from one another), are produced from the chalky soil on which little else than the vine bush will grow. The excellent qualities of the Champagne wines are owing, however, not wholly to the peculiarity of the soil, but in a great degree also to the unremitting care of the growers in the selection and management of their vines, and in the manipulation of the wines, which experience teaches them to make so as to suit the different palates of the lovers of Champagne in the various countries of the world. A curious fact is that the best white Champagne wines are made from black grapes. These are suffered to remain on the vine till they attain

perfect maturity; when gathered they are put in the wine-press, and the first pressings are set apart for wine of the first quality. The juice thus obtained is put into a tun, where it remains from twenty to thirty hours, after which time it is put into sulphured casks, and these are deposited in cool cellars. During the frosty weather the wine is transferred into other casks, and clarified by means of isinglass; this process is repeated once or twice (if necessary) after an interval of a fortnight each time. From the 20th to the 30th of March the bottling process for the effervescing wine begins, but this is sometimes delayed even to the end of May, as the greatest attention must be paid to the temperature of the air, otherwise the delicacy of the wine and its effervescence would be materially injured. The bottles are placed in deep cellars, so as to have the most quable temperature possible, in order to diminish the chance of loss by breakage, which, however, when the wines become brisk in the autumn, often amounts to 20 per cent. Some of the largest dealers have cellars excavated in the chalk-rock, with compartments and passages extending for several miles. They are furnished with stairways, ventilated and lighted with shafts, and usually contain thousands of pipes and millions of bottles in stock. One merchant, for example, has ordinarily about 5,000,000 bottles in stock, and his corks alone cost £6000 a year.

A fine breed of sheep is reared in the department; game abundant; deer and wild boars are met with in the forests; the rivers and ponds yield abundance of fish; poultry is plentiful; bees are carefully tended.

Chalk, flint, millstone of the best quality, building stone, potter's and brick clay, and turf, are the chief mineral productions.

The manufactures are woollen stuffs of all kinds, bonnets, and cotton hosiery, which centre chiefly at Rheims. There are also several tan-yards, dye-houses, paper-mills, glass-works, potteries, rope-walks, oil-mills, soaperies, and establishments for the making of Spanish white.

The most important article of commerce is Champagne wine, the great marts for which are Rheims and Épernay. Other articles of trade are corn, flour, and brandy.

The department is divided into the five arrondissements of Châlons-sur-Marne, Épernay, Rheims, Sainte Ménéhould, and Vitry-le-François. The capital of the department is CHÂLONS-SUR-MARNE.

**MARNE, HAUTE**, a department in France formed out of the southern part of the province of Champagne, and of small portions of Burgundy, the duchy of Bar, and Franche-Comté, is bounded north by the departments of Marne and Meuse, east by that of Vosges, south by Haute Saône and Côte d'Or, and west by the department of Aube. Its greatest length is 81 miles, and the average width is 37 miles. The area is 2402 square miles, and the population in 1886 was 247,781.

The department is mountainous. The plateau of Langres, which links the Cevennes to the Vosges Mountains, and forms part of the watershed between the Mediterranean and the Atlantic, covers the greater part of the south of the department, and sends northwards numerous ramifications along both banks of the Marne. These mountains rise near Langres to about 2500 feet above the sea; they diminish in height as they advance northwards. The valleys extend mostly north and south. In the arrondissement of Vassy, in the north of the department, there are some fine valleys and extensive plains. Here and there all through the department, outlying hills, either singly or in groups, give variety to the surface. More than one-third of the department is covered with forests, in which oak, beech, ash, maple, birch, and poplar are the principal trees. The principal rivers are the Marne, the Meuse, and the Aube. The climate is very healthy; the air is pure and keen in the mountains, where the winters are very cold. In many of the valleys, especially in those that

open into the basin of the Saône, the temperature is warm and equable. The vine is extensively cultivated in favourable situations, and the wine made is of ordinary quality. The milch cattle of the department are of good breed; horses and sheep are small; goats are numerous; poultry and game of all kinds are plentiful. The department has some of the most important iron mines in France; the metal is smelted and manufactured in numerous iron-works of every description. Building stone, marble, alabaster, gypsum, &c., are quarried. Marl, brick-earth, fuller's clay, and turf are dug. Besides ironmongery and cutlery, the industrial products include brandy, vinegar, cotton and woollen yarn, druggot, woollen stockings, leather gloves, cast-iron tubes, paper, leather, beer, &c. Timber furnishes the principal article of export.

The department is divided into the three *arrondissements* of Chaumont, Langres, and Vassy.

**MAROCCO.** See MOROCCO.

**MARONITES**, the name of a sect of Eastern Christians who number about 200,000 persons, and dwell chiefly in the neighbourhood of Mount Lebanon, in Syria. They are neighbours of the Druses, with whom they are on unfriendly terms, and like them they are partly independent of the Turkish power. They occupy the valleys and fastnesses of the principal ridge of Lebanon, east of Beyrout and Tripoli, and they extend inland as far as the plain between the Lebanon and Anti-Lebanon. They are a temperate and industrious race, and among themselves orderly and quiet, while up to 1810 they lived on terms of intimacy and friendship with the Druses. At that period, however, dissension arose, and after many years of savage warfare, an expedition was sent from France in 1860-61, to restore tranquillity. After peace had been restored the two peoples were placed under one governor, a Christian appointed by the Porte, an arrangement which has worked fairly well up to the present. In their internal concerns they are governed by their own sheikhs, who administer well-recognized but unwritten laws, and from whose decision there is an appeal to the bishops, who possess great authority. Originally the Maronites represented a remnant of the Monothelite sect, which, fleeing before the persecutions of the Emperor Anastasius II., in the early part of the eighth century, found refuge in Lebanon, and settled round the tomb of Maron, a saint of the fifth century who had founded several monasteries in these mountains. In the twelfth century, owing to the influence of the Crusaders, they abandoned their distinctive doctrines and recognized the authority of Rome. In return, or by arrangement, they were confirmed in the possession of certain peculiar privileges, such as the use of a Syriac service and permission for the secular parish clergy to marry. The regular clergy follow the rule of St. Anthony, and are bound by vows of chastity and obedience. Every monastery is a farm, and all are under the jurisdiction of bishops, of whom there is one in every village. In 1684 a college for the training of the Maronite clergy was founded by Gregory XIII. at Rome, and many young Maronites are still sent there from Syria to be educated. The Maronites have produced a few scholars, but the clergy, as a rule, are ignorant, fanatical, intolerant, and unscrupulous. They own about a fourth part of the land, and have the people very much under their control. The head of the Maronite clergy takes the title of the Patriarch of Antioch, and has his seat at Kamôhîn. He recognizes the supremacy of the Pope, to whom he sends a report of the state of his patriarchate. The language used by the people is Arabic, but the people appear to have descended from the ancient Syrians.

**MAROONS'** (supposed to be derived from a Spanish-American word signifying *hog-hunters*), a name given in Jamaica to a peculiar race, sprung from runaway negroes, with some admixture of Spanish blood. After Jamaica

was conquered from the Spaniards they occupied the mountainous districts, and in 1730 and 1796 rose in arms against the British power. They are now confined to a particular region, are noted for their hatred to the negro, and their great loyalty to the British crown. See JAMAICA.

**MAROT, CLEMENT** (1497-1544), is one of the most interesting figures in mediæval French literature. In fact he may be regarded as the "father of modern French poetry," a title often applied to him quite as appropriately as the final outcome of the mediæval chivalric style, his fondness for which led him to the work for which we owe him gratitude, the editing and preservation of the great mediæval master, François Villon.

Marot's father was a Norman, and his mother a native of the Gascon town of Cahors, where Clement was born in 1497. He studied as a youth at the University of Paris, and then entered the service of a nobleman. Here he won the favour of Francis I. by a short poem in 1514, and soon became attached to the suite of the king's sister Margaret, afterwards so famous as the Queen of Navarre, munificent patroness of literature, and herself authoress of the "*Héptaméron*" and other works. In 1524 Marot left Navarre to fight with the king in Italy. The Reformation had now definitely established itself, and at the free discussions in Margaret's court Marot had learned to love its doctrines too well for his peace. On returning from Italy he was thrown into prison for heresy, but soon escaped by favour of the king, who now enlisted him as one of his own household. Next year and the year after that he was again in gaol, and was freed by his old patroness, Margaret of Navarre. In 1535 for a fourth time the priests caught him tripping, and he only escaped imprisonment for life, or perhaps the stake, by instant flight. He remained at Venice till 1539, when he returned to Paris and wrote his famous *Psalm*, a very fine translation in verse from the Latin of the Vulgate. The Sorbonne condemned the work, and Marot had to fly. He was received with open arms by Calvin at Geneva, and lived the rest of his life there and in Piedmont, where he died in 1544.

Marot's work is most charmingly finished. Nothing can be more graceful than his ballads. "*Dedans Paris*" and "*En la baisant*" are two of the most exquisite. He is more felicitous in smaller works than in his more ambitious poems; and he hardly ever exceeds 100 lines in any poem. His popularity was great in his own time. His *psalms* may almost be said to have founded the Huguenot party in France. The Hundredth Psalm was set by the musician Goudimel to one of the most famous chants ever written, the unrivalled "*Old Hundredth*." As a specimen of this very celebrated translation of Marot's, the influence of which in Calvin's hands and among the French puritans was so unbounded in its importance, the first stanza of the Forty-third Psalm ("*Judge me, O God,*" ver. 1 and 2) may be quoted—

"Revenge moy, pren à querelle  
De moy, Seigneur, par ta miséricorde,  
Contre la gent fautive et cruelle;  
De l'homme rempli de cautelle  
Et en sa malice endurcy  
Délivre moy aussi!"

**MAROTIA.** See JOHN X., JOHN XI., popes.

**MARQUE'SAS or WASHINGTON ISLANDS,** a group of islands in the Pacific, between 8° and 11° lat. S., 138° 30' and 148° lon. W. There are thirteen principal islands—a south-west group, consisting of Fatoua, Motane, Iivaoa or Ohivahon, Tahuata, Fetuuku (Hood of Cook), and several smaller islands; and a north-west group, in which are Nukahiva, Houapou or Roopoa, Obelisk island, Houna, Motou-iti, Iliou, Fetou-ouhou, and several smaller. The largest island of the entire group, Nukahiva, is 18 miles by 10. Many of them have names imposed by

European discoverers; thus Nukahiva is called Marchand and Martins, Fatouiva la Magdalena, Ilivaoa la Dominica, &c. Most of the islands have a central ridge of high land in the direction of the length, sending down spurs towards either coast, between which are rich well-watered valleys. In the larger isles the heights range from 2000 to 3000 feet, and the shores are bold and rocky, but with good harbours. They are all of volcanic origin, abrupt and rocky, with deep water all round, and scarcely any coral. Nukahiva, the largest, has a central extinct volcanic crater, the rim of which is 8442 feet above the sea. The produce is sugar-cane, cotton, coconut, bamboo, yams, and pulse. The people, who are Malay-Polynesians, are indolent, but ingenious, fierce and warlike, and repeatedly resisted with success, under command of their chiefs, the attempts of the French to form settlements; the French, however, at last prevailed, and now claim them as a colony. They also resisted the attempts of missionaries, and long remained in a state of heathenism of the most cruel and sensual character. But there are now several missions. The best harbours are Resolution Bay, Tahmata, and Jarvis Bay, in Houaoun. The area is about 400 square miles, and population about 6000.

**MARQUETRY** and **PARQUETRY** are two names for grouping small pieces of wood into ornamental devices, the one for producing pictures and small decorative works, and the other for floors. Most marquetry work is a delicate kind of veneering. The groundwork is well-dried oak or fir, secured from warping. The coloured woods are sawn into very thin plates and dyed or otherwise prepared. They are then cut into the requisite shape by means of an exceedingly delicate saw, and the subsequent process is almost precisely similar to that of veneering and **INLAYING**. The cabinet-makers of France, Italy, Belgium, and Germany are remarkable for the beautiful marquetry furniture they manufacture. Sometimes the wood is inlaid with other materials, such as metal, ivory, shell, &c. **Parquetry** is a plainer kind of marquetry, little varied as to the different colours of the wood, and generally used as flooring. At Windsor Castle, the London Royal Exchange, and other places, parquetry floors have been laid down in recent years.

**MARQUIS** (Old French *markis*, that is, keeper of the mark or boundary of the state), a title of honour in England, France, and Italy. It ranks second in the five orders of English nobility. The eldest sons of marquises take by courtesy their father's second title, whether earl or viscount. The younger sons and the daughters of marquises are usually addressed as Lord Edward, Lady Caroline, &c., with the family name.

There were no English marquises before the reign of Richard II. In the reign of Edward III. a foreign marquis, the Marquis Juliers, was made an English peer with the title of Earl of Cambridge, and this circumstance probably suggested to King Richard the introduction of the new order of nobility. The person upon whom it was conferred was his favourite Robert de Vere, earl of Oxford, created Duke of Ireland and Marquis of Dublin in 1385.

The only nobleman sitting in the House of Peers as a marquis, whose title dates before the reign of George I is the Marquis of Winchester. Seven marquises were created at the close of the last century, namely, those of Salisbury, Bath, Abercorn (duke in the Irish peerage), Bute, Hertford, Lansdowne, and Townshend. The other eleven marquises are all of recent creation, though most of them were old peerages under inferior titles.

The title seems not to have been known in Scotland till 1599, the date of the marquises of Huntly and Hamilton.

**MARRIAGE**, a term used to designate the status of a man and woman conjoined in matrimony, and also the solemnity by which they are united.

Marriage has ever been in its essence a natural and civil institution, and it has existed, and still exists, under very different conditions in different countries. It seems odd to us, for instance, to learn that the Hassaniyeh Arabs consider their wives tied to them for three days, but perfectly free on the fourth. Inasmuch as the sexes are nearly equal in numbers, monogamy or the marriage between one man and one woman may be said to be the natural law; and it is the practice which prevails most widely throughout the world. Polygamy, or the marriage of one man to two or more women at the same time, is, however, a very ancient and a very widespread custom, and it has been sanctioned and regulated among nations in all stages of civilization. It was permitted by the law of Moses, and we even find the possession of many wives included among the blessings of Jehovah (2 Sam. xii. 7, 8); but in the post-Babylonian period monogamy appears to have become more prevalent, and in the establishment of Christianity the decision of the apostles is plainly given in favour of the latter practice (1 Tim. iii. 2, 12). At the present day it is found that even in countries where polygamy is recognized, the majority of the people are monogamists, either from choice or necessity. The custom of polyandry, under which a woman has several husbands, is much rarer in its occurrence, but there is indubitable evidence that it has existed in ancient times, and it is still recognized in some parts of the world. Still rarer is the custom (probably once universal) of communal marriage. It lingers among the Andamanians, Bushmen, &c. In the earliest times we find that men obtained their wives in the same way in which they acquired other possessions, viz. by capture, gift, or sale; and according to the best authorities the first of these methods is the most primitive, and the others represent advances in civilization. In Sumatra in one form of marriage the man purchases the woman, and in another the woman purchases the man. The contract of sale seems to be the foundation of the marriage relation in most systems of ancient law, and it prevails to a wide extent among imperfectly civilized peoples at the present day. Further, although it seems almost absurd to us to regard children otherwise than as equally related to father and mother, the study of savage races shows us quite clearly that at first a man was related merely generally to his tribe; the first advance was the acknowledgment of a special tie to his mother, but *not* to his father, which in races yet higher is replaced by a relationship to his father and not to his mother (a state of things continuing almost to the highest civilization, as in Rome, where mother and children were slaves, *familia*, of the father of the family), and last of all as the child of both.

The Chinese and the Jews and the modern Greeks always break some glass or porcelain as part of the marriage ceremony, the understanding being that the marriage is to endure till the broken pieces reunite. For instance, at the marriage, with a young Greek, of the daughter of the famous M. Renan at Paris in 1882, the aichmadrите filled a cup with wine, which the bride and bridegroom shared between them, and then the latter dashed the empty cup upon the ground so that it broke into a thousand fragments.

The views of the great classical peoples as to marriage were essentially divergent, the Romans taking a business-like view and the Greeks holding a lofty religious conception. In fact, a Greek marriage among the ancients was almost as much a public as a private concern. To rear children to the state was as honourable as it was pleasant to rear them in the family, and to provide for the continuance of worshippers of the gods was as earnestly taught to be necessary as to provide for some one to fulfil the children's office over one's own tomb, without which serious risks were run in the other world beyond the grave. From this latter need arose the custom of adoption among child-

less persons. At Sparta legal proceedings were justifiable, and were often taken, against persons marrying unsuitably (as, for instance, taking a wife from another state), or marrying too late in life, while a merciless raid was made upon the pockets of bachelors beyond a certain age, who were never free from heavy fines. Sacrifices were offered on betrothal. At the marriage itself there was no religious rite, but a solemn procession at nightfall from the bride's father's house to the bridegroom's, with many beautiful symbolical ceremonies and a formal banquet, to which the utmost possible number of guests were invited as witnesses. Upon the withdrawal of the bride and bridegroom to their chamber the *epithalamium*, or nuptial song, was sung outside the closed door.

Before Justinian's time a Roman marriage was either regular (*matrimonium legitimum*) or irregular (*illegitimum*). The essentials of a regular marriage were right of intermarriage between the parties (*coniubium*), the attainment of the ages of fourteen and twelve respectively, and the consent both of the parties themselves and of their fathers, if they still remained under their *patria potestas*. Of regular marriages there were two distinct kinds, according as the wife passed, or did not pass, into the hand (*in manum*) of her husband. A wife who passed *in manum* of her husband became at once a part of his family. She was *totā uxore* and *materfamilias*. She was admitted to participate in the sacred rites of his house, and her personality was completely merged in that of her husband. In his family she held the place immediately before his daughters, and was subject to his paternal authority equally with his children. All her property passed to her husband as dowry (*dos*), and at his death she claimed a daughter's share of his inheritance. Her children were born, and remained in the power of their father, until they were liberated by emancipation or by his death. The very word *familia* meant rather a body of slaves than what we mean by a FAMILY. Among the Sabines marriage was always accompanied by this *conventio in manum*, and till the Etruscans were admitted to the state a similar rule was observed at Rome. There were three modes by which a wife might pass into the hand of her husband—*Confarreatio*, *Coomptio*, and *Usus*.

1. *Confarreatio* was a form of marriage confined to patricians, performed by the Pontifex Maximus and Flamen Dialis, and deriving its name from a corn cake eaten together by bride and bridegroom on these occasions. This is the origin of our wedding cake. We derive the wedding ring also from the Romans, and Roman wives wore it on the ring-finger of the left hand, as is still the custom with ourselves. *Confarreatio* required the presence of ten witnesses, and could only be dissolved by *diffarreatio*. The offspring of such marriages were eligible for the highest sacred functions; and from them at first the various flamens and vestal virgins were exclusively selected. This form of marriage fell into disuse in the time of Gaius, and was abolished by Constantine in 391.

2. *Coomptio* was an imaginary mutual sale (*mancipium*) in presence of five witnesses and the balance-holder.

3. A wife passed *in manum* of her husband *usu* (that is, "by prescription," another form of ownership), when she continued to live with him as his wife for a whole year uninterrupted. If she wished to avoid the legal effects of this cohabitation, she might, according to the laws of the Twelve Tables, break the *usus* by absenting herself from her husband for three nights during the year. This form of marriage seems to have been introduced after the admission of the Etruscans to the state. The ease with which the yoke of marriage by *usus* was borne is nowhere better exemplified than in the following two examples. Cato the Younger, the best and most moral of the aristocrats who waged the death-struggle of the republic, at once divorced his wife on finding that a friend loved her, that

she might marry him; and with as much readiness took her back after his friend's death. For an example under the empire we may take the complaint of St. Jerome, who notices the marriage of a twenty-fifth wife with her twenty-fourth husband!

By a regular marriage *sine manu* the wife was only naturally, and not civilly, related to her children. Her property did not pass to her husband, and the patrimonial rights of the spouses were thus obliged to be defined and settled by marriage contracts. This was the common form of marriage in the time of Gaius.

An irregular marriage was something more than mere concubinage. It was a valid marriage between those who had no *coniubium*, as, for instance, between Romans and foreigners, or between Roman patricians and plebeians in the earlier republican times, for this only became legal in B.C. 445, and was considered disreputable for two centuries later. There were, of course, no civil consequences, and no *patria potestas* resulting from it; and the consent of the parents of the parties was not required.

By the legislation of Justinian the complicated distinctions of the early Roman law were done away with. Marriage became a consensual contract, and a valid marriage (*iusta nuptiæ*) was constituted by the mere interchange of assent between parties, provided they were both Roman subjects.

The origin of the wedding cake and ring have been given among the details of the ancient Roman marriage; that of the honeymoon arises from the once universal custom of capturing the bride by force (real or assumed), and carrying her away from her friends till her wifehood was admitted. A similar origin explains the throwing of shippers, &c., after the departing pair, the relics of much more serious missiles formerly hurled at them.

*Marriages under Christianity.*—The highest ideal of the marriage relationship is that which has been developed within the Christian church, throughout the larger portion of which marriage is regarded as a sacrament. This is the doctrine of the Roman Catholic Church, and though many of the Protestant churches reject it, they all regard marriage as a sacred and divinely-appointed ordinance, and accompany the ceremony with religious rites and observances. By the law marriage is regarded as purely a civil contract, and with certain important exceptions the ordinary principles which attach to contracts in general apply to the marriage contract. The terms and conditions of the marriage contract vary greatly in different countries, and subjoined will be found a few particulars in reference to the marriage laws which prevail in the United Kingdom.

*England.*—In England, until about the middle of the eighteenth century, there were three distinct methods of marrying. There was marriage by public celebration in the church or *in facie ecclesie*, the conditions of which were the publication of banns or the grant of a license to dispense with them, the performance of the marriage ceremony in the parish church between the hours of eight and twelve in the forenoon, and when the spouses, or either of them, happened to be under age, the consent of their lawful guardians. There was clandestine marriage by a clergyman episcopally ordained, when all these conditions were neglected; and again there was consensual marriage, or marriage by the simple consent of the parties themselves in words, either written or spoken, implying a present contract or a promise followed by cohabitation. But in the view of the temporal courts there was always this difference between the first and second, and the third kind of marriage—while the two former were good *ab initio*, the last was only potentially good. The two former rendered a subsequent marriage void, the last only rendered it voidable. If A. contracted a consensual marriage with B., and afterwards a marriage *in facie ecclesie* or a clandestine marriage with C., the

temporal courts would recognize the second and not the first. But if B. went to the ecclesiastical courts, as could always be done, and compelled A. to celebrate the consensual marriage regularly, the temporal courts would then repudiate the second and admit the first marriage. Lord Hardwicke's Act of 1753 abolished clandestine and consensual marriages, and made due celebration in church after banns or license, and the consent of lawful guardians in the case of minors, essential to the validity of a marriage. This important departure from the old common law of England was not effected without much opposition, but it remained in force for the next seventy years, and it was not until 1836 that the Registration Act was passed, and purely civil marriages became legal in England.

The most important Acts now in force by which marriage is regulated are the 4 Geo. IV. c. 76 and the 6 & 7 Will. IV. c. 85 (amended by 7 Will. IV. and 1 Vict. c. 22 and 3 & 4 Vict. c. 72). By virtue of these Acts marriage may now be legally contracted in England in either of the following modes:—(1) By *special license* granted by the Archbishop of Canterbury, which enables the parties to be married in any church, chapel, or convenient place, and at any hour; (2) by *ordinary license* granted by any archbishop or bishop, under which they may marry in any church or chapel in his diocese where banns may be lawfully published; (3) by *banns*, which must be published in the church, or a public chapel in which banns are allowed to be published, of the parish or chapelry wherein each of the parties dwells, immediately after the second lesson of the morning service, or of evening service if there be no morning service, upon three Sundays preceding the solemnization; (4) by certificate of the superintendent registrar of a district without license; and (5) by such certificate with license. With respect to the two last methods of effecting marriage, it is provided that where persons desire to be married by registrar's certificate without license, notice must be given to the registrar of the district or districts within which the parties have resided for seven days previous, which notice is inscribed in a marriage-notice book open to public inspection at all reasonable times, and thereafter suspended for twenty-one days in some conspicuous place in the registrar's office. During this period any person whose consent is necessary to an ecclesiastical license may forbid the issue of a certificate, but failing such prohibition the certificate will issue at the end of twenty-one days. When a registrar's certificate with license is required, notice must be given to the registrar of the district in which one of the persons resides, together with a declaration that he or she has resided for fifteen days therein, that there is no impediment to the marriage, and that the necessary consents, if any are required, have been obtained. The notice is not exhibited in the registrar's office, and the certificate may be obtained at the expiration of one whole day after entry, together with the license. If the marriage is celebrated in a dissenting chapel (and for that purpose such chapel must be duly licensed and registered) a registrar of the district, with two witnesses, must be present; and while the minister may use any form of service, the ceremony must include a mutual declaration of assent by the parties, and a disavowal of any impediment. If the marriage is to take place without any religious service it must be celebrated in the office of the superintendent registrar, with open doors, in his presence and that of another registrar of the district and two witnesses. Formerly all marriages in England, except those by special license, were required to take place before twelve noon; but by an Act passed in 1886, the hours were extended from 8 a.m. to 3 p.m.

In addition, in order to constitute a valid marriage, it is necessary that the persons should be capable of standing in the relation of husband and wife to each other, which implies that there should be no natural or legal disability.

Total and permanent disability on either side to consummate marriage will render the contract void. Temporary disability from illness does not affect the validity of a marriage. Temporary disability from defect of age does not invalidate the marriage, but it leaves the party or parties at liberty to void or to confirm such premature union on attaining the age of consent, which for males is fourteen and for females twelve. Each party must have the will to contract marriage with the other, therefore idiots and insane persons, who cannot understand the nature of the conjugal relation, are incapable of contracting marriage.

Consanguinity within certain degrees, and affinity also, are legal impediments to marriage. The degree of nearness which disables parties from uniting in marriage varies in different countries, and has varied at different periods in our own. [See AFFINITY and CONSANGUINITY.] The impediment to marriage arising out of consanguinity applies in the same degree to illegitimate as to legitimate consanguinity, and the impediment resulting from affinity is created by illicit connection as well as by marriage. The Council of Trent restricted the impediment of affinity arising out of illicit connection to the second degree.

*Scotland.*—In Scotland the law of marriage differs in many important particulars from that of England and Ireland. According to the law of Scotland marriage is constituted by consent, and consent only. The various forms of marriage which are there recognized are, properly speaking, the different modes in which the law allows or requires such consent to be proved.

1. *Public or Regular Marriage.*—This must be preceded by due publication of banns in the parish church, according to the rules of the church, or by the publication of a notice of marriage by the registrar in accordance with the provisions of the Marriage Notice Act, 1878 (41 & 42 Vict. c. 43). The ceremony is performed in presence of at least two witnesses. It may take place at any hour of the twenty-four, and does not require to be in a church or any place of worship. The celebrant is a clergyman, minister, or priest of some religious denomination; but Quakers and Jews may solemnize marriage according to their respective usages, provided the parties be both Quakers or Jews respectively. The marriage must be duly registered in terms of 17 & 18 Vict. c. 80, s. 46, and 23 & 24 Vict. c. 85, s. 15. Marriages celebrated in accordance with the above requirements are all declared to be regular marriages by the Act of 1878; but the celebrant proceeding without a certificate of banns or registrar's certificate, and the registrar granting such certificate without due compliance with the statute, and married parties failing to register as required by the Acts, incur penalties of a more or less serious kind.

2. The following are termed irregular marriages:—(1) *Clandestine marriages.* These also are performed by clergymen, and differ from regular marriages in this only, that they are not preceded by publication of banns or the registrar's notice of marriage, and under the Act of 1878 expose the celebrant to a penalty not exceeding £50. (2) *Marriage by declaration of consent de præsenti.* The consent may be given either verbally or in writing, or even by signs, but it must be proved to have been given seriously, deliberately, and unconditionally, and one at least of the parties must at the time have had his or her usual residence in Scotland, or have been living in Scotland for twenty-one days immediately preceding (19 & 20 Vict. c. 96, s. 1). When the proof of consent depends on a written acknowledgment, such document must have been produced and acted upon during the lifetime of both parties in order to give the woman the status of a widow. (3) *Marriage by promise and subsequent copula.* A promise or engagement to marry followed by *copula* is held to establish marriage, because it presumes consent *de præsenti* to have been given at the time of the *copula*; but this is

only a presumption which may be redargued by proof, and a conditional promise is not enough. It seems also to be the sounder opinion that promise *cum copula* only constitutes a pre-contract which the woman can enforce, while both are still alive, by taking legal proceedings for that purpose. The promise must be proved by the writing or judicial oath of the objecting party, and both promise and *copula* must take place in Scotland. (4) *Marriage by cohabitation with habit and repute.* Where persons have lived openly together as man and wife, and have been so regarded by their friends and neighbours, it will be presumed that consent has duly passed, and consequently that they are married persons. But if the cohabitation have begun in concubinage a clear change of purpose must have been shown to raise the connection into one of marriage by habit and repute, and in all cases the cohabitation must have been regular and consistent, and the repute uniform and undivided. Irregular marriages may be registered by the parties on obtaining a warrant from the sheriff on a joint application. Those convicted before a magistrate or justice of the peace of having contracted an irregular marriage must register it, and when it has been established by decree of court either party may register it, and the magistrate or clerk of court must give notice of such conviction or decree to the registrar under a penalty. A certified copy of the entry in the register is evidence of the marriage.

We began by stating that in the law of Scotland consent is of the essence of marriage. Hence the most formal acknowledgment of marriage, even though made *in facie ecclesiæ*, will be of no avail, if it shall appear that such was not the true intention of parties. In the case of regular marriages the presumption for consent is so strong that it can rarely be redargued, though cases of this kind have occurred; but in the case of irregular marriages it must always be steadily kept in view that consent must be clearly made out, and this forms the best test to ascertain what amount of evidence will be required by the court in any given case.

*Ireland.*—In Ireland the law was formerly the same as the old law of England or the present law of Scotland, and the provisions of Lord Hardwicke's Act were not introduced there until 1818, and then they only applied to members of the Established Protestant Episcopal Church. Mixed marriages, i.e. those between Roman Catholics and Protestants, were void if celebrated by a Roman Catholic priest, and marriage between two Protestants if celebrated by a Roman Catholic priest was void also. A penalty was also imposed upon any Roman Catholic priest who should marry any such persons, but he might perform the marriage ceremony after it had been performed by a Protestant clergyman. This law was repealed by 33 & 34 Vict. c. 110, which permits mixed marriages to be validly celebrated by an Episcopalian or Roman Catholic clergyman, subject to conditions set forth in sec. 38. In other respects the law of Ireland agrees with that of England.

With a view of putting an end to the confusion which exists owing to the differences in the laws of marriage in the three kingdoms, and of introducing some approach at least to similarity between them, a very influential royal commission was appointed in 1866, and after having investigated the matter very thoroughly, they issued their report in 1868. Their chief recommendations were, that throughout the three kingdoms notices such as are now given to registrars under the Registration Act should be substituted for banns and licenses; and that all ministers of religion, of whatever denomination, should be intrusted with the powers now exercised by the registrars, and that they should be able to receive and publish notices of marriage, to celebrate them, register them, and grant the usual certificates. They also proposed that marriages should be allowed to be solemnized, as in Scotland, in any place and at any time. In 1875, seven years after the

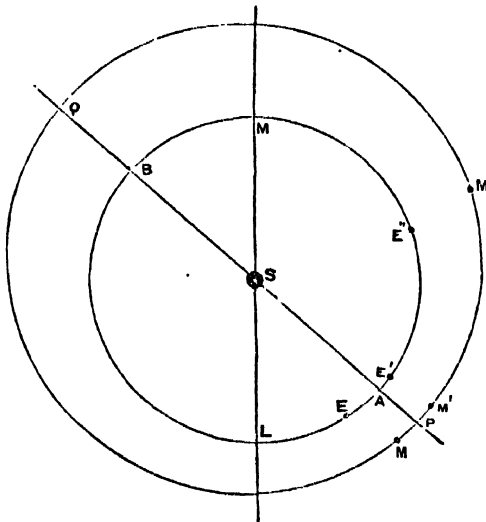
report of the commission was made, Lord Chelmsford, who was its chairman, inquired in Parliament if there was any prospect of the government acting on the report and bringing forward a measure to assimilate the marriage laws of the three kingdoms. The ministerial reply held out very little hope, and up to the present no alteration has been made. For the present law with respect to husband and wife see the article HUSBAND AND WIFE.

Generally speaking, a marriage valid according to the law of the country in which it was contracted is valid in every other country; but this depends upon the law of domicile of the parties. Thus if the contracting parties, being in the relation of husband and deceased wife's sister, marry abroad where it is lawful, and they be of English domicile, then the marriage is a nullity in this country; but if the parties had been domiciled abroad, then the marriage would be lawful here also. In connection with the question of domicile, it may be mentioned that while marriages contracted abroad between French subjects, or between French subjects and foreigners, are valid in France if celebrated according to the forms of the foreign law, this is only the case when the peculiar conditions of the French law as to banns and consent of parents have been observed. In France a son under twenty-five, and a daughter under twenty-one cannot marry without consent of the father and mother, or of the father only if they disagree, or of the survivor if one be dead. If both are dead grandfather and grandmother take their place; and if neither parents nor grandparents be alive parties under twenty-one require the consent of "the family council," a committee composed of six relatives or family friends, presided over by the *juge de paix* of the party's domicile. Where the parties are over twenty-five and twenty-one respectively they are still bound to ask the consent of their parents; until the age of thirty and twenty-five respectively this request must be repeated twice in the event of a refusal being received, and after a third refusal the parties are at liberty to marry without consent. One formal request suffices if the parties are over the ages of thirty and twenty-five; but by the use of certain legal proceedings which apply to these cases an obstinate parent can delay a marriage for at least two years after receiving the last of the formal requests, and this no matter what may be the age of the son. One of the results of this peculiarity of French law has been to enable dissolute young Frenchmen to marry in other countries and on their return to France to repudiate their marriages, which they had purposely contracted without complying with the necessary formalities in France. In this repudiation they have been sustained by the French courts, and many cases of grievous hardship have arisen in this way. As Englishwomen have been the chief sufferers, the matter was brought under the consideration of the French government by the English foreign minister, and after careful consideration of the subject the French government have prepared a form of certificate, which, when filled up by the French consul, will serve to show that the necessary forms have been complied with, and will render the marriage valid in France. If this be adopted, and an enactment be passed forbidding any clergyman or registrar to unite the contracting parties, where one of them is a French subject, without the consular certificate, the grievance which has hitherto existed will probably be removed.

**MAR'ROW** or **MEDULLA** is the fat contained in the osseous tubes and cells of the bones. [See BONE.] Spinal marrow and Medulla spinalis are names sometimes applied to the spinal cord.

**MARS.** We refer to the article SOLAR SYSTEM for a general view of the position of Mars as a planet, as well as for the numerical details of his orbit, and other particulars. We shall here discuss the special features of the planet and of his two satellites. Mars is the nearest of the superior planets to the earth. He completes a revolution about the

sun in 687 days, and as the earth moves round in 365 days, it is easy to calculate that about once in every 780 days the earth overtakes Mars, and we have what is known as an opposition, at which time Mars is of course as near as possible to the earth. The orbits of the earth and Mars are neither of them circles, so that the circumstances of different oppositions vary very considerably. In the annexed figure we have represented the elliptic paths of the earth,  $LM$  being the axis of the earth's orbit, and  $PQ$  that of the orbit of Mars. It will thus be seen that the orbits come much closer together in the neighbourhood of  $A$  and  $P$  than at any other points. If, therefore, it should happen that when Mars was at  $P$  the earth was at  $A$ , we would have the two planets at the nearest possible position, and Mars would thus be in a position especially favourable for observation. The earth passes the point  $A$  on 26th August of each year; if, therefore, an opposition of Mars is to be favourable it must occur about that date. Various oppositions are shown on the figure, as  $E\ M$ ,  $E'\ M'$ ,



$E'' M''$ . This may be illustrated by the opposition of 1877, which occurred on 5th September, or only ten days after the best date possible. In 1845 the opposition took place eight days before the critical date. On the other hand a very unfavourable opposition occurred on 13th February, 1869, the earth being then near the point  $A$  of its path through which it passes each year on 22nd February. It is worth noticing that Mars accomplishes seventeen revolutions in very nearly thirty-two years, or twenty-five revolutions in forty-seven years. It therefore follows that a favourable opposition will be followed in thirty-two years, and also in forty-seven years, by favourable opposition. For example, we have mentioned that thirty-two years before the opposition in 1877 a favourable opposition occurred in 1845. We therefore infer that forty-seven years after this date—i.e. in 1892—a favourable opposition may be looked for.

From observations of certain spots or marks on the surface of Mars, it has been concluded that the planet rotates on its axis, and by comparing observations made in the year 1666 with those made during the next 200 years, the period has been found to be 24 hrs. 37 min. 22.735 secs. The equator of Mars is inclined to the plane of its orbit at an angle of 28 degrees. The ellipticity of its disc is practically insensible.

Mars is specially interesting as an object of telescopic research. The equatorial regions can be distinctly divided into light and dark portions, while around the poles is a region of brilliant white. Many drawings of the planet

have been made, so that it is possible to form maps of its surface, and many such maps have been published. Schiaparelli's map in particular (see Plate) exhibits a most marvellous complexity on the surface of the planet.

The opposition of Mars in 1877 will be memorable as the occasion of the most brilliant telescopic discovery of the present century. Professor Asaph Hall, using the great object glass in the observatory at Washington, discovered the outer satellite on 11th August, and the inner satellite on the 17th. The exterior satellite revolves in a period of 30 hrs. 17 mins. 53.86 secs., and the interior satellite in 7 hrs. 39 mins. 13.996 secs. The periodic time of the interior satellite presents a phenomenon unparalleled in the whole solar system. It actually rotates around its primary three times, while the primary turns once on its axis. In all other known cases the period of the swiftest satellite is much greater than the time of rotation of the planet. A physical explanation of this remarkable phenomenon has been found by Mr. G. H. Darwin. He has shown that the action of the sun has produced tides in Mars, and that these tides have gradually slackened the velocity of the planet's rotation without appreciably affecting the revolution of the satellite.

**MARS**, the god of war among the Romans, corresponding to the Greek **ARES**. He is often called Marspiter (Father Mars), as Jove is called Jupiter (Father Jove). His name in the oldest form in which we have it was *Maurus*, whence on the one hand the form Mars, and on the other *Mavors*, and the unusual *Mors*; double forms were beloved in the provinces, as *Mar Mor*, *Mar Mar*, and the Ocean *Mamers*. *Maurus* or *Mors* was the killing god (Lat. *mors*, death), hence the god of war. He was the oldest divinity of Rome, the patron and protector of the burgesses, guarding the flocks and hurling his spear at the foe. To him was dedicated the first month of the year (the Roman year beginning with March), and to no other god was any month dedicated. Similarly, he alone of the gods gives family names, *Marcus*, *Mamercus*, &c. Further, to him alone of the gods do the ancient genuinely-Roman legends refer. The two great colleges of *Salii* (Leapers) and *Luperci* (Wolves) were especially held by his priesthood. So important was he that each tribe and nation had its own Mars-worship; and late into the empire lasted the double colleges of *Salii* and *Luperci*, which had refused to blend when the Romans and Sabines formed themselves into one state at the commencement of Rome's history. The wolf, sacred to Mars, was the emblem of Rome, and wolves are preserved on the Capitol to this day. The woodpecker was also sacred to the god. He was worshipped in peace under the name of *Quirinus* (spear-bearer), and in war under that of *Mars Gradius*, the double name of *Quirinus* and *Mars* of course being a survival of the distinct worship of the Sabines and the Romans. As the protector of agriculture he was styled *Mars Silvanns*. According to a principle in Roman mythology, by which a male and a female deity are supposed to preside over the same object of fear or desire, the Romans had a goddess of war called *BELLONA*, but the name of the wife of Mars was *Neria*. Mars is represented with a beard, but in other respects, as the Greek civilization spread in Rome, he came to be identical with the Greek *Ares*.

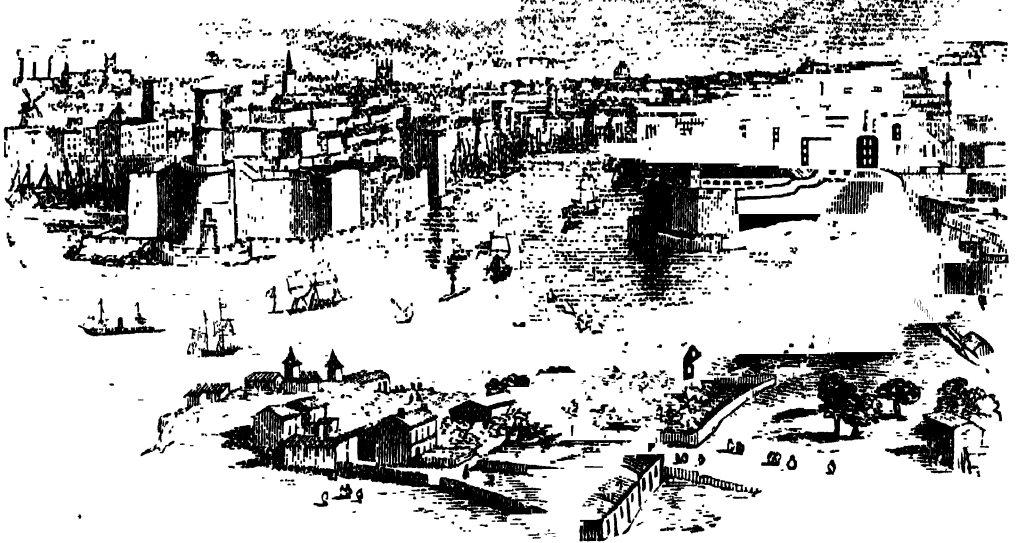
**MARSALA**, a town at the western extremity of Sicily, 16 miles S.S.W. of Trapani, with a population of 40,131 in 1882. The country around produces very good white wine—somewhat resembling sherry—which is largely exported. This trade has entirely grown up within the present century, chiefly owing to Lord Nelson having adopted the wine for use in the British fleet in 1802. Marsala also exports corn, cattle, oil, salt, and soda, in small quantities. The city is inclosed by bastioned walls, and has a cathedral, several convents and abbeys, a gymnasium, cavalry barracks, a curious vibrating bell-tower, and a famous grotto

and well. There are salt mines and caves of white marble in the vicinity. Don John of Austria filled up the ancient port in 1580, to prevent its becoming useful to corsairs; and the new port, about a mile to the south, bounded by a mole, is adapted only for small vessels. Marsala occupies the site of *Lilybæum*, the ancient capital of the Carthaginian settlements in Sicily. It was chosen by Garibaldi as the landing-place of his volunteers in his famous Sicilian campaign in 1860. The port was once in possession of the Arabs, and was by them esteemed so highly that they called it "Marsa Alla" or "Port of God." Hence its present name.

**MARSEILLAISE HYMN.** When Barbaroux summoned the youth of Marseilles—the 600 men "who knew how to die"—to proceed with him to Paris during the great French Revolution (July, 1792), they introduced into the capital the revolutionary song which soon became so celebrated, commencing with the thrilling and fiery words, "*Aux armes! aux armes!*" and it has ever since

been called the *Marseillaise Hymn* in their honour. It was, however, really written by Claude Joseph Rouget de Lisle, an artillery officer, to commemorate the departure of a band of volunteers from Strasburg, both verse and tune being composed in one night (24th April, 1792). So magical was its effect that it procured 400 additional volunteers in Strasburg in a single day, and soon became very popular in all the south-east of France. Its use, because it aroused republican passions, was strictly forbidden throughout France during the reign of Napoleon III. The fine harmonies we now possess to this wonderful hymn are the work of the composers Grétry and Gossec. Rouget de Lisle's own setting was poor, and ends with a quite puerile flourish at the close in the accompaniment.

**MARSEILLES** (the Roman *Massilia*), a seaport and city in France, capital of the department of Bouches-du-Rhône, is situated on the coast of the Mediterranean, 534½ miles by railway S.S.E. from Paris, and had 362,676 inhabitants in 1886. The mean temperature of the year in



Marseilles.

Marseilles is 57°; in winter, 45°; in summer, 72° Fahr. It is the chief port of the Mediterranean and of France. The old harbour is a natural oblong basin, 1000 yards long by 330 broad, extending into the heart of the town, occupying an area of 70 acres, about equal to two of the docks at Liverpool. To it Marseilles is indebted for her commercial consequence, which dates back nearly 3000 years, from the days when the Phœceans set foot on her shore, conveying to the barbarous inhabitants of Western Europe the civilization of the East. In recent times the connection of France with Algiers has given a great impetus to the prosperity of the city, as it engrosses nearly the whole trade with the African colony.

The increase of trade is continually demanding additional accommodation. In 1853 the Port de la Joliette

was added to the ancient port, and is now the starting-point of most of the steamboats. The Bassin du Lazaret and d'Arené were added next, in 1856 the Bassin Napoleon (now National), and still more recently the Bassin de la Gare Maritime. Other extensions are projected. The old harbour is long and narrow. Marseilles gives title to a bishop, whose diocese comprehends the town and the arrondissement, and it is the headquarters of the Ninth Military Division.

Marseilles is built round an inlet of the sea, which runs east into the heart of the town and forms the harbour. At the back of the city are lofty precipitous hills, and the land around was formerly bare and desert, but the canal, which supplies the city with water from the Durance, and has a length of 94 miles, crossing the valley of the Arc by



a magnificent aqueduct, has altered the aspect of the country by the irrigation which it furnishes. Where once nothing but dust, scorched rocks, and bare high walls appeared, the eye now finds groves of trees and verdure to rest on.

The streets of the old town are for the most part narrow, and the houses high, irregular, and massive. It contains numerous squares of vast magnitude: among others the Place Neuve and Place des Grand-Carnes. The modern town, which comprises two-thirds of the whole city, consists of wide handsome streets. Many elegant fountains add to their beauty, and give a relief to their monotonous regularity. The boulevards are planted with large and handsome trees. Marseilles has a custom-house, an exchange, a mint, theatres, a tribunal of commerce, a national academy of sciences, letters, and arts; an academy of medicine, and many other learned societies; a national college, with a library of 80,000 volumes; a school of hydrography, a botanical garden, several museums, an observatory, an arsenal, and other public institutions, besides many literary, scientific, and charitable societies. The Catholic churches are numerous, including a cathedral in the Italian style. There are also a Protestant church and a synagogue; but the public buildings, as a rule, are of little architectural importance, except the Hotel de Ville. The shops, however, rival in splendour the finest in Paris.

The chief imports are of raw cotton, wheat (chiefly from the Black Sea and the Sea of Azof), coffee, oil seeds, silk, wool, olive oil, raw sugar, lead, iron, and coal, besides enormous quantities of ores and metals, timber, hides, spirits, dye-woods, and divers articles from the Levant. Large quantities of silkworms' eggs have likewise been imported from foreign parts, chiefly Japan, and great efforts have been made to revive the silk production in the south of France. The exports are wines, brandy, corn, refined sugar, dried fruits, oil, soap, hosiery, damask and other linens, woollens, silks, leather, &c. The local manufactures consist of soap, lucifer matches, leather, glass, porcelain, hats, gunpowder, alum, sulphur, vitriol, and cantary. The refining of sugar and salt, calico printing, the distillation of brandy, essences, and liqueurs, cork cutting, and the preparation of anchovies, dried fruits, olives and wine for exportation, are carried on. There are numerous flour mills, and other extensive manufactures of salt, soda, chloride of lime, cement, machinery, &c.

In the neighbourhood of the city are extensive lignite mines and stone quarries. The climate for a portion of the year is delightful, but in summer and autumn the heat is sometimes intense, and mosquitoes abound. At Marseilles the *mistral*, the *magistral*, or "masterful" wind, which prevails upon the western and north-western coasts of the Mediterranean, and is sometimes so violent as to overturn railway trains and do great damage to vegetation, blows on an average for 176 days in the year.

The town has undergone many changes. Founded by the Phœnicians (600 B.C.) under the name *Marsilia*, it fell into the hands of the Romans under Caesar, but retained its original aristocratic constitution. It subsequently became the prey of Burgundians, Visigoths, and Franks. Marseilles was active in the Crusades, and at that time carried on extensive commercial intercourse with the East. In the thirteenth century the citizens organized themselves into a municipal republic, but they were soon after deprived of many of their privileges by Charles of Anjou. They adhered to the house of Anjou, and their town was burned and sacked in consequence by the king of Aragon in 1480. Upon the death of Charles, count of Maine, Marseilles came directly under the government of the French crown, to which it has ever since remained subject. It was ravaged by the plague in 1720.

**MAR'SHAL** (French *maréchal*), a term which, in its origin, meant simply a groom or manager of horses (Old

High German *marah*, a horse, whence our word *mare*, and *sealh*, a servant); but from the importance of such an employment in a rude warlike nation, the office of marshal became invested with great military authority, which, according to the usage of the times, drew to itself a considerable civil jurisdiction; and even at present one of the principal officers of state in England is the king's marshal, which office is now held hereditarily by the Duke of Norfolk, who is said to have the office of marshal of England, and also an honour in respect of which he is earl marshal. In feudal times it was the duty of the royal constable and marshal to inspect the troops assembled before the king, and they also fixed the encampment of each noble. They likewise had the regulation of all matters connected with armorial bearings, standards, and ensigns, and held a court (*curia militaris*) for the trial of such pleas. The last court was held in 1737. Appeals from it only lay to the king himself. From the time of the Conquest the marshal was always a member of the king's council. The constable's functions were abolished in the reign of Henry VIII., and the marshal then became the sole judge in questions of honour and arms, and he is still the president of the English College of Arms, and appoints the kings-at-arms, heralds, and pursuivants. In time of peace the office was executed in the *aula regis*, or king's great court. Upon the division of the aula regis, the marshal appointed deputies in the new courts. In the King's Bench the marshal's deputy was called the marshal of the marshalsea of the King's Court, or marshal of the King's Bench. In the Exchequer, the deputy was marshal of the Exchequer, or clerk of the marshalsea of the Exchequer. The duty of the acting marshal was regularly to attend the court, and to take all persons committed to his custody by the court. Besides the earl-marshal, there is a knight-marshal, or marshal of the king's household.

The original importance of the office of earl-marshal or earl-mareschal is shown by the fact that William, second earl-mareschal, one of the leaders in the Magna Carta contest, was the most powerful ruler in England at John's death, and it was he who had the honour of driving out the French and inaugurating the government by the charter as regent for the youthful Henry III. His son Richard, third earl-mareschal, led the revolt against Henry when he began to govern for himself, and to govern against the charter; and his death in a skirmish in Ireland in 1254 was the reason of the long delay in reform, lasting till De Montfort's time. The dignity of marshal, under the title of marischal, formerly existed in Scotland and was hereditary in the Keith family, but in 1716 George, the tenth earl-marischal, was attainted in consequence of his share in the rebellion, and the dignity has not since been restored. In France the highest military officers have been called marshals since the thirteenth century. See **FIELD-MARSHAL**.

**MARSH'S APPARATUS.** See **ANESTHETIC**, **DETECTION OF**.

**MAR'STON MOOR**, an extensive moor, now in considerable measure reclaimed and cultivated, about 5 miles west of the city of York. It was the scene of the famous battle in which Prince Rupert and the Duke of Newcastle, who commanded the Royalists, were defeated by the Parliamentarians under Leslie, Fairfax, Manchester, and Oliver Cromwell, 2nd July, 1644. This battle was one of the most important in the Civil War, and completely shattered the Royalist cause in the north at a time when the king's prospects in other parts of the kingdom were unusually bright.

**MAR'STON, JOHN**, a dramatist in the reigns of Elizabeth and James I. the particulars of whose life, and even the dates of whose birth and death, are, like those of many of his contemporary poets, very uncertain. We only know that he was educated at Oxford. He began as a

satirical poet in 1598, with three books of satires, "The Seourge of Villénie," followed by the "Metamorphosis of Pignallion's Image." Archbishop Whitgift did him the honour to burn these by the hands of the public hangman in 1599, when he and Bishop Bancroft, as official censors of the press, decreed that for the future no satires or epigrams would be allowed to be printed. Marston then took to drama, and produced "Antonio and Mellida" and a sequel, "Antonio's Revenge" (1602), followed by his best play, "The Malcontent" (1603), dedicated to Ben Jonson. A few other of his plays have survived the ravages of time. He also wrote masques for the court with Ben Jonson, and took part with him and Chapman in "Eastward Hoe" (1605). Yet in 1602 he had joined Dekker in a literary attack on Jonson for his assumed unofficial censorship of the drama, called "Satiromastix" (a Whip for the Satirist), a very pithy performance, which brought Jonson to his knees. Heywood, Middleton, Dekker, and Marston are the best of the later Elizabethans, after Jonson.

**MARSUPIA'LIA** is an order of **MAMMALIA**, of which it forms one of the primary subdivisions, the Metatheria of Professor Huxley, intermediate in character between the Prototheria or Monotremata and the Eutheria or placental mammals. The marsupials are entirely confined, at the present day, to the Australian regions, with the exception of one family, the Didelphidae or Opossums. The name is derived from the general presence of a *marsupium* or pouch, formed by the rising up of a fold of integument in the abdominal region in the female, which serves to protect the young, which are born in an extremely immature helpless condition; in some marsupials, however, as *Myrmecobius*, there is no trace of a pouch, the young being concealed and protected only by the long hair of the mother's abdomen. The marsupials present a striking difference to the higher mammals with regard to the development of the embryo. The period of gestation is very short, and no placenta is formed. The embryo, when born, is very immature, that of the great kangaroo being a little worm-like creature about an inch in length. In this state it is transported in the mother's mouth to the pouch, and placed upon one of the long nipples situated on the abdomen. As the young marsupial has no power of voluntary suction, the mother squeezes the milk into its mouth by means of the crenaster muscle, which is largely developed and spread over the surface of the mammary gland.

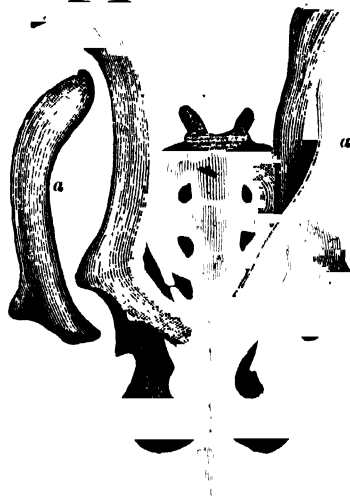
The skull of the marsupials presents some reptilian characters, many of the sutures persisting throughout life. The brain cavity is small. The angle of the lower jaw is more or less inflected, a character to which there is one exception. Tarsipes, one of the Phalangers. True teeth are always present, divisible into incisors, canines, premolars, and molars; but the typical mammalian dentition is widely departed from, the incisors in some families, the molars in others, being numerous. Only one tooth, the first premolar, is preceded by a milk tooth, which is sometimes shed before the others have cut the gum, and is quite functionless. The brain is generally small; the cerebral hemispheres are never much convoluted, and are provided with a very small corpus callosum and a well-developed anterior commissure.

In nearly all, the so-called "marsupial" or epipubic bones ( $\alpha$  in cut) are present in both sexes. These are, in fact, ossifications of the inner tendon of the external oblique muscle, and have no special relation to the marsupium, being found also in the Monotremata. In Thylacinus they are represented by small unossified cartilages.

Except in the structure of the brain and the presence of marsupial bones the marsupials agree more nearly with the placental mammals than with the Monotremata. There is no common cloaca into which the alimentary, urinary,

and genital canals open, as in the monotremes, but the anus and the termination of the urino-genital canal are embraced by the same sphincter muscle. Two venæ cavae enter the heart. The oviducts do not meet in a common uterus, as in higher mammals.

This order presents an extraordinary range of forms, nearly every order of placental mammals finding its type among the marsupials. Thus the kangaroos recall the ruminants, the phalangers and opossums the squirrels and monkeys, the wombats and bandicoots the rodents, the Dasyuridae the carnivora. Professor Owen has divided the marsupials into five suborders:—Rhizophaga (root-eaters), containing the Wombats (*Phascologyidae*, Plate, fig. 3); Poëphaga (plant-eaters), containing the Kangaroos (*Macropodidae*, figs. 1, 2); Carpophaga (fruit-eaters), containing the Phalangers (*Phalagistidae*, fig. 5); Entomophaga (insect eaters), containing the Bandicoots (*Peramelidae*, fig. 6) and Opossums (*Didelphidae*, fig. 4); and Sarcophaga (flesh-eaters), containing the Dasyuridae (fig. 7). Professor Flower bases his classification on the character of the incisor teeth. In one group, to which the name Polyprotodont is applied, the incisors are numerous, small, and



Pelvis and marsupial bones of the Koala (*Phascogalea cinerea*).

nearly equal in size, while the canines are large, and recall those of the Carnivora. This suborder includes the Entomophaga and Sarcophaga of Owen. The Diprotodont marsupials on the other hand have two very large cutting incisors in either jaw, but the other incisors and canines are either small or absent; these are all more or less vegetable feeders, and include the wombats, phalangers, and kangaroos. Figs. 8 and 9 belong to the order MONOTREMATA.

In strata of the Secondary period remains, chiefly in the form of ramified lower jaws of small mammals, have been found, as *Microlestes* and *Dromatherium* from the Trias, *Amphitherium* and *Phascotherium* from the Stonesfield slate of the Lower Oolite, *Plaginax* from the Middle Purbeck beds. We have not sufficient evidence to show whether these were marsupials or generalized forms from which both marsupials and higher mammals took their origin. The marsupials are very sparsely represented in the Tertiary age. In Europe, in Eocene and Miocene strata, remains have been found of marsupials closely resembling the living species of opossums (*Didelphidae*). In the bone-caves of Australia of Post-tertiary times fossil remains have been found of several gigantic marsupials, agreeing most nearly

In their dentition with the kangaroos and phalangers. Diprotodon was a vegetable-feeder like the kangaroo, but the disproportion between the two pairs of feet was not so great; in size it must have surpassed a rhinoceros. Thylacoleo was originally described as a carnivorous and predatory marsupial. It is remarkable for having the first premolar in both jaws enormously enlarged, compressed, and frenchant. Judging from the general dentition and other characters, however, its affinities are rather with the kangaroos. Beside these remarkable forms fossils referable to existing genera are abundant in Australian Post-tertiary beds. The extinct animals are usually much larger than their living representatives. The Post-tertiary fossil marsupials of North and South America belong to the opossums (Didelphidae).

**MAR'SYAS**, whom the god Apollo slayed alive for his temerity, was (according to the legend in the Greek mythology) a peasant of Phrygia. He picked up the flute thrown away by Athena so soon as the mirrored surface of a pool showed her to herself with mouth distorted by playing. Marsyas quickly reached proficiency, and rashly challenged the god of music himself to a contest, with the Muses for umpires, he with the flute, Apollo with the lyre. The contest was undecided till Apollo sang as well as played, when Marsyas was instantly condemned. Apollo bound him to a tree and slayed him alive, and from the streams of blood which poured from the poor wretch the river Marsyas sprang. Statues of Marsyas were often erected in Roman towns as warnings against presumption. There was a celebrated one at Rome in the Forum, which Horace jocosely alludes to in his Sixth Satire, pretending that the horror and pain in the victim's face arise not from Apollo's fierceness, but from beholding the sons of freed slaves (such as Horace himself) in high favour, or even in the seats of magistracy at Rome, just opposite to his own pedestal.

**MARTABAN'**, one of the four divisions of British Burma, is situated between Pegu and Tenasserim. The chief town is Martaban, on the banks of a river of the same name, and near its mouth in the Gulf of Martaban. It is a small decayed place, but has some temples, and near the river is a battery built of stone. The town was captured by the British in 1852.

**MARTEL, CHARLES.** See CHARLES MARTEL.

**MARTELE** and **MARTELLATO**, literally "hammered out," are terms applied in instrumental music to notes delivered with weight and a forced staccato effect, from their great similarity to the strokes on an anvil.

**MARTELLO TOWERS**, the name given to a number of small forts erected on many parts of the British coast, more especially the southern portion, as a defence against invasion. The original models of them are towers erected on the coasts of Sardinia and Corsica from about 1530 to 1550. They were built in England chiefly between 1795 and 1800. They are circular buildings constructed of masonry, built in two storeys, and reaching to a height of about 40 feet. The magazine is placed in the base, and the two storeys above are designed for the reception of stores and for the accommodation of troops. The roofs are vaulted, the outer walls  $5\frac{1}{2}$  feet thick, and the upper storey is bombproof. On the terreplein of the roof pieces of artillery may be placed, resting on platforms of timber and traversing on pivots, so that the guns are capable of being fired in any direction. When complete the whole work is surrounded by a ditch and glacis. They never had to stand the test of actual warfare, and the great advancement in the power of artillery has rendered them obsolete as means of defence against an enemy's war vessels. The armament has been removed from most of them, and they are generally either deserted or occupied by the Coastguard.

**MAR'TEN** (*Mustela*) is a genus of carnivorous mammals belonging to the family MUSTELIDÆ. The martens

are distinguished from the weasels by having an additional premolar on each side in each jaw, thus making the total number of teeth thirty-eight, and the lower carnassial tooth having a small minor tubercle. The body is not so long and flexible as that of the weasels, and the limbs are longer, though still short. In their habits the martens are more arboreal than the weasels.

The Pine Marten (*Mustela martes*) is a native of this country, where it is now becoming rare; it is widely distributed throughout the northern parts of Europe and Asia. The pine marten is a very pretty and attractive animal. The body is long and mobile, and terminated by a long bushy tail; it is between 16 and 18 inches in length, while the tail measures nearly a foot. The fur is a beautiful dark brown, lighter on the cheeks and snout, and becoming yellow of varying shades on the throat and breast. The pine marten is essentially arboreal in its habits, living in woods, and from the usual abundance of coniferous trees in these it is probable that it derived its name. It preys on small mammals, especially mice, birds and their eggs, and occasionally lizards and frogs. The female usually makes a nest in a hollow of a tree, of moss, leaves, and grasses. From four to seven young are produced at a birth. When taken young the marten may be easily tamed, making a very agreeable pet, as it has not the offensive odour of a weasel. The dark-coloured furs are deemed the most valuable, and they are in the best condition during the winter season.

The Beech Marten or Stone Marten (*Mustela foina*) is distinguished by the greater breadth of the skull across the zygomatic arches, by slight differences in the dentition, and by the under fur being grayish-white instead of reddish-gray, as in the pine marten. The outer fur is dull grayish-brown, becoming on the throat pure white. The beech marten agrees generally in its distribution with the pine marten. It is stated by some authors to be by far the more common of the two in this country, but according to Mr. E. R. Alston (*Proceedings, Zoological Society*, 1879) it never was a member of the British fauna. When naturalists relied chiefly on the colour of the fur as distinctive, the observation of living specimens displaying variations of colour from age, sex, or season, and of faded museum specimens, led to the belief in two distinct species, or at least two varieties. Until Mr. Alston's conclusions are disproved, the beech marten must be struck out of the list of indigenous British mammals. It is, however, the common species on the Continent. In appearance and habits it agrees closely with the pine marten, but, though often found in woods, it is said to prefer stony and rocky localities, and to affect the vicinity of farmyards and homesteads; while the pine marten is more reclusive, and frequents the deep forests.

The American Marten (*Mustela americana*), better known as the American Sable, is a closely allied species, and is widely distributed in North America. The general colour of the fur is brown, varying in shade considerably; the throat patch is tawny yellow. In size, appearance, and general habits it does not differ from its European congeners. An enormous number of these martens are trapped for the sake of the fur, which is so valuable that when of fine quality it is often sold as Russian sable. The martens are caught in wooden traps, baited with any kind of meat, and placed at regular intervals for many miles, forming what is called a marten-road. The greatest enemy of the trappers is the Glutton or Wolverine (*Gulo luscus*), who cunningly contrives to possess himself of the bait while avoiding all danger to himself. The RUSSIAN SABLE (*Mustela zibellina*) and the PEKAN (*Mustela pennanti*) are described under those headings.

Considerable confusion exists as to the generic name of the martens. Cuvier gave the name *Putorius* to the weasel, polecat, &c., distinguishing the martens and the

sables under the name Mustela. Subsequently the name Mustela was given to the more typical members of the family, the weasel and its allies, while the generic name Martes was invented for the martens. The rule of priority, however, seems to dictate the use of Cuvier's nomenclature.

**MAR'TIAL** (*Marcus Valerius Martialis*), the famous Latin epigrammatic poet, by birth a Spaniard, was born at Billulis in Spain in the year 43, came to Rome under Nero in 66, lived there till the year 100, and then returned to Spain, where he died in 104. Not only the emperors Titus and Domitian, but the entire people were his patrons, and he acquired some considerable wealth. It is impossible not to wish that the favour had been better deserved, for Martial's wit has often nothing whatever to do with decency, and a good half of his best work is shut out from our enjoyment in these purer times. Still, much remains that is available, and even where one laments his grossness, one is compelled to admire his prodigious cleverness. Martial must be regarded as at once the founder and the perfecter of the epigram; the short pithy poems, turning on some witty play of words or conceit of fancy, are keen pointed rapiers in his hands. From no one do we derive more acquaintance with the inner life and customs of imperial Rome than from him.

**MARTIAL LAW.** Under this term are included the series of regulations made to preserve order and discipline in the army, and enforced by the prompt decisions of courts-martial; the law as administered by military force during insurrection and rebellion; and the rules by which hostilities are regulated between armies or nations at a time of warfare.

The constitution of this country permits a military law for the government of the army, even in times of internal tranquillity, to co-exist with the general law of the land. But the former applies to military persons only; and at the same time, any military person committing an offence against a subject of the realm, punishable by the law of the land, must be delivered over to the civil magistrate. The military jurisdiction comprehends all matters relating to the discipline of the army, to the cognizance of which the civil courts are not competent—as disobedience of orders, cowardice, &c.; and extends to such crimes as desertion, mutiny, and holding correspondence with the enemy. But inasmuch as the raising and keeping a standing army within the United Kingdom in time of peace, unless it be with the consent of Parliament, is illegal, the crown is only intrusted with the power of drawing up Articles of War for one year at a time, the power being given each year by the passing of the Mutiny Act. The first Mutiny Act was passed in 1689, and the practice continued until 1879, when, chiefly owing to the obstruction of public business practised by some of the Irish members, it was superseded by the Army Discipline and Regulation Act (12 & 43 Vict. c. 33), the provisions of which are contained in five parts and upwards of 180 sections. In order, however, to preserve the full control of Parliament over the army, it was provided that the Act should not remain in force except in pursuance of an annual Act passed specially for the purpose. By this Act the sovereign is empowered to make Articles of War and Rules of Procedure, and to convene and grant authority to convene courts-martial with a jurisdiction to try and punish offences according to such Articles of War and the provisions of the principal Acts. Courts-martial have full authority within their own jurisdiction, and there is no appeal from their decision to the ordinary courts of law, but an application may be made to the sovereign in council praying for a revision of the proceedings.

During the existence of a rebellion, when, in consequence of the ordinary processes of law becoming ineffectual for the security of life and property in any province or state, the legislature has appointed that a military force shall be

employed to suppress the disorders and secure the offenders, and when the trial of the latter takes place according to the practice of military courts, that province or state is said to be subject to martial law. Any province occupied by a hostile army is usually considered to be under martial law.

On the occurrence of rebellion in any part of the British dominions, the two Houses of Parliament, jointly with the crown, may determine that a temporary suspension of the Habeas Corpus Act shall take place. This measure is adopted only in cases of great emergency, and the times of its duration are always stated in the provisions of the Act. In merely local tumults the military commander is called upon to act with his troops only when the civil authorities have failed in preserving peace, and the responsibility of employing soldiers on such occasions falls entirely upon the magistrate.

With respect to martial law as it regulates the carrying on of hostilities between armies and nations, the tendency of late years has been happily in favour of gentleness and moderation. Formerly war was attended with the most savage cruelty, which extended not only to the actual combatants, but also to all classes of people who were drawn within its influence. Many scenes depicting the torture and mutilation of prisoners have been found triumphantly inscribed upon the ancient monuments of Egypt and Assyria, while in the historical and prophetic books of the Old Testament we find a multitude of references to the cruelties inflicted by the Israelites upon those whom they conquered, and to the sufferings of the Israelites themselves at the hands of those who subjugated them. At the present day, in civilized warfare, the lives of prisoners are respected, wounded enemies are cared for where possible, nurses and doctors are recognized as non-combatants and are protected by both sides, and private property is respected within certain recognized limits by military commanders. These admirable rules, however, can only be carried out when the conflict is between two nations of nearly equal civilization, and as we have seen of late years, war with savage or semi-civilized peoples has to be carried on much on the old lines of wholesale slaughter.

**MAR'TIN** was the name borne or assumed by five popes.

**MARTIN I.** (649–655), *Saint Martin*, for he is canonized (to be distinguished, however, from St. Martin, bishop of Tours, who died 397), succeeded Pope Theodorus in June, 649. He at once headed the religious revolt of the Western Church against the religious supremacy of the emperor. Seizing upon the weak point of Constantinople, its advocacy of the MONOTHELITE heresy, Martin called a council at the Lateran in October, and procured its sanction to a hot denunciation of the *Ekthesis* of the late Emperor Heraclius, as equally heretical with the *Typos* (type or pattern) of the reigning Emperor Constant. He sent letters and legates to the kings of the Franks, the English, the Spanish, and other nations to join in this movement. The angry emperor had him arrested and sent first to Naxos in 653, then brought, still unrepentant and loud in his anathemas, to Constantinople itself in 654. Here the brave old man still refused to retract his accusations, and submitted, though so weak as to be scarcely able to stand, to having his clothes torn to pieces upon his body, and to the welding of an iron collar around his neck, by which he was dragged to an ice-cold dungeon through the streets of the city. Here he lay eighty-five days, after which he was taken by ship to the wild regions of the Chersonese (Crimea), where he soon perished in the greatest misery, 16th September, 655.

**MARTIN II.**, also called *Martinus* (881–884), conducted as legate the many and intricate negotiations between the occupancy of the patriarchate of Constantinople by PHOTIUS, whom he finally installed in 879, and managed this so

successfully that he was elected to succeed John VIII. As pope he condemned Photius in 883 after all. It is interesting to know that he had a great regard for our Alfred the Great, and sent him as a present of great price a small piece of wood, reputed to be a fragment of the true cross, brought from Palestine by the mother of the Emperor Constantine five centuries before.

MARTIN III., also called *Marinus II.*, was pope in succession to Stephen VIII. from 942 to 946.

MARTIN IV., *Simon de Brion* (1281-85), was born in Brie 1210, became keeper of the seals to St. Louis of France, Louis IX., in 1260, was made cardinal in 1262, and succeeded Nicholas III. in 1281. He sank into a mere vassal of Charles of Anjou, brother of St. Louis, who resided with him at Orvieto, and thence governed his kingdom of Naples. In Charles's interest he excommunicated the emperor, Michael Palaiologos, upon whose tottering empire the King of Naples had serious designs. When the terrible "Sicilian Vespers" showed the bitter hatred of the French rule, the Pope at once excommunicated the popular party and proclaimed a crusade against Sicily. Pedro III., king of Aragon, who assumed to lead the rebels, also received the papal excommunication, and his kingdom was (on parchment) given to Charles of Valois, the brother of Philip III. of France, and successor to the claims of Charles of Anjou, who had died. A crusade was declared against Pedro. But before he could make any further efforts for his native country the French pope died at Perugia, 1285.

MARTIN V., *Ottone Colonna* (1417-31), was born about 1368, and became cardinal in 1405. The Council of Constance elected him as successor to John XXIII., whom it deposed because his crimes rendered it impossible for him to gain the public respect and so to overcome the schisms which the council had been called especially to bring to an end. Martin V. was chosen because of his high rank in the nobility and his well-known purity of conduct. His rule was stern and powerful. He resumed all the authority of his most vigorous predecessors, even in questions which had been settled against the papacy by decrees of councils or by custom; he set on foot the bitter persecution of the Hussites (1418), made a solemn pilgrimage through Italy to Rome (1419-20), to make it evident that the Italian schism had finished, and received the submission both of the Spanish antipope, Clement VIII. (the successor of the stubborn antipope Benedict XIII., who had fought so long a fight), and of the deposed pope, John XXIII., whom after severe penance Pope Martin restored to the dignity of cardinal. Thus he closed the wounds of the church. By the tardy piety of the condottiere, Braccio Fortebraccio, many states were restored to papal rule, and before his death in 1431 Martin had restored order, and the beginnings of power also, to the long-distracted church. He even amassed considerable wealth. The Council of Constance had decreed that there should be a general council every five years, and had appointed Pavia as the place for the council of 1428. Pope Martin accordingly convoked the council there, but with great astuteness contrived its failure and its adjournment to Basel in 1430. He just lived to see the famous Basel Council assemble. Had he lived longer he might have conciliated that assembly also, and saved much trouble to the church.

**MARTIN, JOHN**, an eminent English painter, was born near Hexham, in Northumberland, in the year 1789. In his youth he was an apprentice to a painter of heraldic designs on coach panels at Newcastle. In 1806 he removed to London, to reside with the well-known enamel painter, Charles Musso or Moss.

When in his nineteenth year he married, and with difficulty managed to support his wife and himself by teaching a few pupils, and painting designs on glass and china. While engaged on his first great picture, "Zadok in search

of the Waters of Oblivion," he was frequently brought to the verge of starvation. When completed, however, the work soon attracted the attention of connoisseurs, and Martin found himself famous.

Martin's most celebrated pictures are "Joshua commanding the Sun to stand still," "Belshazzar's Feast," "Macbeth," the "Fall of Babylon," "Destruction of Herculaneum," the "Creation," the "Deluge," the "Seventh Plague," the "Paphian Bower," and the "Fall of Nineveh," all displaying the same conspicuous qualities—a lofty imagination, delighting in the expression of vast mysterious spaces and sharply contrasted flashes of light and gloomy darkness, all depicted with a curious exaggeration of colour. He died in 1854. His pictures are very successful in engravings, and are much admired in that state.

**MARTIN MAR'PRELATE** was the name under which many vigorous early English Puritans assailed the bishops and the English Church system under Elizabeth. Bishop Cooper answered some of the Martinist pamphlets, and drew down a paper avalanche upon his head, the culminating year being 1589. John Penry, John Udall, John Field, and Job Throckmorton were the chief of this courageous though anonymous band. Their tracts purposed to be "printed over-sea, in Europe, within 2 furlongs of a bounding priest, at the cost and charges of Martin Marprelate, gent.," &c.; but in reality the press was a wandering one, hunted by the officers of the angry queen from Molesey (Hampton Court) to the north, then to many different places in the Midlands. Penry, a member of both universities, was caught printing at Manchester and hurried to the gallows; Udall died in prison under sentence, and like fates befell others of the band. One of Bacon's first important pieces was a paper, rather against the Martinists, on "The Controversies of the Church," wherein he sought to win both sides to greater moderation. The whole movement marks the beginning of English nonconformity.

**MARTIN** is the common name given to several well-known birds belonging to the SWALLOW family (Hirundinidae).

The House Martin (*Chelidon urtica*) is a common bird in this country, and is often mistaken for the swallow, especially when on the wing: it may, however, be readily distinguished by the pure white colour of the lower part of the back. The house martin is a common summer visitor to all parts of Europe, extending its migrations even as far north as Lapland and Iceland. In Asia it is common in Siberia. It migrates to South Africa towards winter, returning in the spring a few days later than the swallow. In their general habits, in their mode of life, and their fondness for building about the habitations of men, the martins exactly resemble the swallows, and they share with them in the favour which seems to be universally regarded as their due, both from the familiarity of their habits and their character as the harbingers of summer. Like the swallows they pass nearly all their time on the wing in pursuit of insects; they are also very fond of the vicinity of water, over which they may constantly be seen skinning, now sweeping about in wide circles, now flying straight along, with their wings nearly touching the surface, and dipping their little beaks into the fluid, for the purpose of drinking. The nest is placed under the cornices and eaves of houses, in the upper angles of windows, and in similar situations. It is composed of mud or wet clay carried to the nest in pellets in the bird's bill, and is lined with feathers and straws: when completed it is in the shape of an incomplete hemisphere, with a small aperture at the top. The eggs are four or five in number, of a pure white colour. Two or even three broods are produced, but the last brood is often hatched so late that the parents have to migrate and leave the nestlings to perish. The general migration takes place about the middle of October. The house martin is a small bird, measuring less than 5½ inches in

length; the plumage of the upper parts is of a rich, glossy bluish-black colour, except on the rump, which is white; the whole lower surface of the body is pure white, and the quill feathers of the wings and tail are black. The wings are long and pointed, reaching quite to the extremity of the tail, which is moderately forked.

The Purple Martin (*Progne purpurea*) is the common martin of America, spending the summer in the United States and Canada, and wintering in South America. In the United States it is customary to prepare nest-boxes, often containing a dozen or more compartments, for these birds to breed in. This kindness is well-deserved, for not only do they destroy vast quantities of insects, but their hostility to all birds of prey is so great that they afford an excellent protection to the poultry-yard. The purple martin is about 8 inches in length, and the general colour of the plumage in the male is a deep rich purplish-blue, with the exception of the wings and tail, which are brownish-black. The female is blackish-brown above, with a slight bluish or violet gloss; the chin and breast are grayish-brown and the belly whitish. The birds begin to build about two days after their arrival, taking up their residence in any convenient cavity, frequently, where no accommodation is specially prepared for them, taking possession of some of the compartments of a pigeon-house. The nest, which is rather bulky, is composed of dry leaves, straws, hay, and feathers; the eggs are four in number, and pure white. There are two broods, of which the first (in the middle states) appears in May, and the second late in July. These birds by no means confine themselves to country places, but like the martins of our own country, come freely into the towns and cities, and sweep about boldly even in the most crowded streets. Their flight is exceedingly swift and easy, and they sail much with the wings expanded. They leave the United States for the south about the end of August.

The SAND MARTIN (*Cotyle riparia*), another common British species, is described under that heading. The name martin is given to several species of the genus *Hirundo* in Australia.

**MARTINEAU, HARRIET**, a celebrated English authoress, was born 12th June, 1802, at Norwich, where her father was a manufacturer. The family was of Huguenot extraction, the founder in England having settled at Norwich after the revocation of the Edict of Nantes. She was well educated, and the early infirmity of deafness, as well as a natural nervousness and weakness of constitution, threw her much upon her own resources and developed habits of thoughtfulness and meditation. When almost a child she exhibited a talent for literary composition, and in 1821 she began to write anonymously for the *Monthly Repository*, a Unitarian periodical. In 1823 her earliest complete work appeared in the form of a little volume of "Devotional Exercises for the use of Young People." In 1826 her father died, and the family suddenly found themselves in greatly reduced circumstances, their little property being still further diminished shortly afterwards by the failure of the house in which their money had been invested. Harriet had now to seek a means of livelihood, and she betook herself to literature, in which field she continued to labour until the end of her life. In 1830 appeared her "Traditions of Palestine," imaginative sketches of life at the time of the Messiah, and the same year she gained three prizes awarded by the Unitarian Association for essays on the "Promotion of Christian Unitarianism." Her next venture was a series of tales illustrative of the truths of political economy, which after being repeatedly rejected by publishers appeared in 1831, and at once became exceedingly popular. She followed these with a series illustrative of taxation, and then composed four stories illustrating the action of the Poor Law, the whole series being completed in 1831. The same

year she paid a visit to America, where she received a warm welcome and made a long stay, afterwards publishing an account of her observations in her "Society in America" in 1837, and her "Retrospect of Western Travel" in 1838. Her works on America were followed by "Deerbrook," a novel, in 1839, and "The Hour and the Man," a historical fiction, in 1840. Meanwhile she had fallen seriously ill, and it seemed likely that she would become a confirmed invalid. Lord Melbourne offered her a pension on the civil list, which she declined for fear of compromising her political independence, whereupon her friends purchased for her a small annuity. She remained confined to her couch until 1844, but her pen was busy all the time, and she produced several tales for children, and her "Life in the Sick-room," a series of essays published in 1843. In 1844 she submitted herself to a course of mesmerism and was in a few months restored to health, her recovery, particulars of which she published in sixteen "Letters on Mesmerism" in 1845, giving rise to no little speculation and controversy. To the same year belong her "Forest and Gann Law Tales," the title of which explains itself. In 1846 she took a journey to the East, visiting Egypt, Palestine, and Syria, and on her return published a study of the historical religions of the countries visited in "Eastern Life." In 1849 she wrote for Mr. Charles Knight one of the best of her works, entitled "The History of the Thirty Years' Peace," which she followed in 1851 by an "Introduction to the History of the Peace." The same year she published a volume of correspondence with her friend Mr. H. G. Atkinson, in which a kind of philosophic atheism was represented as being the final goal of human thought. This book was received with strong disapproval by the public generally, and it was sharply handled by the reviewers. Mr. Atkinson's letters were also very severely criticized by Dr. James Martineau, the brother of Harriet, who was at that time one of the editors of the *Prospective Review*, a circumstance which awakened a feeling of resentment on the part of Miss Martineau, which no explanation and no kindly approach on his part could ever afterwards remove. In her abandonment of theism she had been greatly influenced by the writings of Comte, and she prepared a condensed English version of his "Philosophie Positive," which appeared in 1853, and which to most readers is more intelligible than the original. In 1855 she found herself suffering from a severe form of heart disease, and believing her end to be approaching she wrote her "Autobiography" and had it printed in readiness for issue after her death. She lived on, however, until 27th June, 1876, and during the whole of the time her literary activity was incessant. In addition to an immense correspondence she contributed a large number of essays to the *Westminster Review* and to other magazines; while as a member of the staff on the *Daily News* she contributed no less than 1612 articles to that journal. She had purchased a small farm at Ambleside in Westmorland, in 1846, and it was there she died. To the last she took the greatest interest in every movement which had for its object the social, physical, and moral improvement of society, and she corresponded largely with the leaders of such movements, many of whom applied to her for counsel and advice. Unflinching industry, sincerity, and high-minded courage were her chief characteristics, and though she lived by her pen her work was always thorough and sound, and no writer ever displayed more single-mindedness and independence. As to her power as a thinker no description has ever surpassed that which she wrote for the *Daily News* in anticipation of her death: "Her original power was nothing more than was due to earnestness and intellectual clearness within a certain range. With small imaginative and suggestive powers, and therefore nothing approaching to genius, she could see clearly what she did see and give a clear expression to what she had to say. In short, she

could popularize while she could neither discover nor invent."

(Her "Autobiography," with additional passages by her friend, Mrs. Chapman, was published in Boston and London in 1877. An excellent biography by Mrs. F. Fenwick Miller also appeared in London in 1884.)

**MARTINEAU, JAMES, D.D.**, brother of the preceding, was born at Norwich, 21st April, 1805. He was educated first at the Grammar School of that town, and afterwards under the care and tuition of Dr. Lant Carpenter at Bristol. At the age of sixteen he was placed in the machine works of Mr. Fox at Derby, but notwithstanding his interest in the work, being strongly inclined towards the Unitarian ministry, he was permitted by his father to enter the Manchester New College then at York, where he remained as a student until 1827. He then spent a year as partner in Dr. Lant Carpenter's school, at the end of which he became junior minister of a Presbyterian church in Dublin. Here he married Helen, the eldest child of the Rev. E. Higginson of Derby, and in addition to his ministerial duties he undertook the preparation of a few pupils for Trinity College. On the death of the senior minister of his church he received the offer of the pastorate, but as he strongly disapproved of the injustice then prevailing in connection with the Roman Catholic Church and the two Protestant churches in Ireland, he would not accept the *regium donum*, and so had to decline the offer. On this becoming known among the Unitarians of England, he was invited to become joint minister of a church in Liverpool, where he laboured with much success for several years, and during this period he contributed largely to the *Monthly Repository*, and other religious magazines and reviews. In 1840 he was appointed professor of mental and moral philosophy and political economy in Manchester New College, a position for which he was eminently qualified, and the duties of which he discharged with unremitting zeal and splendid success. In 1857 he resigned his church in Liverpool and took up his residence in London, becoming soon afterwards, with the Rev. J. J. Tayler, one of the pastors of the Unitarian Chapel in Little Portland Street, retaining also his connection with the Manchester New College, which had now become established in London. In 1869 he was appointed principal of this institution, the theological training school for the Unitarian Church, a position which he retained until 1885.

As a preacher he stood in the front rank of the Unitarian divines of his period, and his discourses were always marked by a high level of thought, lucidly and eloquently expressed, and pervaded throughout with that reverence and devotion which can alone give the preacher power to reach the hearts of his hearers. In addition to his many contributions to the *London*, the *Westminster*, the *Prospect*, the *National*, and the *Contemporary Review*, some of which were republished under the titles "Miscellanies" (1852); "Studies of Christianity" (1858); and "Essays, Philosophical and Theological," two vols., he produced many valuable works of a devotional and theological character, among which may be mentioned the "Rationale of Religious Inquiry" (1836); "Endeavours after the Christian Life" (1843); "Hours of Thought on Sacred Things" (1876 and 1879). By those who knew him best, however, it was always felt that he had never in any of these works displayed his full strength as a thinker and theologian, and it was understood that he had in prospect a series of works which should contain the final results of his studies in the great subjects of philosophy and religion. These anticipations were in part realized in 1885 when he gave to the world, through the Clarendon press, his "Types of Ethical Theory" (two vols. 8vo), a work displaying the most profound scholarship, and a wonderful power of keen and subtle analysis, but which, unlike the majority of philosophical works,

is written in the most admirable English style, and is marked by the utmost clearness and lucidity of expression. A competent critic has pronounced this work to be the most important contribution towards the study of ethics which has appeared in England since the days of Butler, and its completion is anticipated with lively interest in philosophical circles everywhere.

In 1872 the degree of LL.D. was conferred upon him by the Harvard (United States) University, and that of T.D. (*Theologia Doctor*) by the University of Leyden on the celebration of its tercentenary in 1875, while in 1881 a tardy recognition of his labours was made in his own country by the degree of D.D., which was conferred upon him by the Edinburgh University.

**MARTINI, GIAMBATTISTA**, a famous musical teacher and composer, usually called *Padre Martini*, as he was a Franciscan monk, was born at Bologna in 1706, and became choir-master of the chief church there in 1725. He soon was recognized as the most learned musician in Italy, and Burney, who met him in 1770, reports that his musical library consisted of 17,000 volumes. It was in this same year that Mozart, a boy of fourteen, was kindly welcomed by Martini at Bologna. Martini wrote four volumes of a "History of Music," excellent for its time, but only complete as far as ancient music. The materials amassed for the remaining volumes still exist in the Minorite Convent at Bologna. His other great work was an important treatise (with a collection of the finest older examples) on counterpoint. A few pieces of Martini's are still played. His death in 1784 was viewed as a national calamity, his learning and his gentle manners having made him hosts of friends and admirers.

**MARTINI, SIMONE**, the real name of the artist more usually called *MEXMI*.

**MARTINIQUE** or **MARTINICO**, one of the French West India islands, between 14° 21' and 14° 53' N. lat., and 63° 6' and 63° 31' W. lon., with an area of 381 square miles, and a population in 1881 of 167,181—the large majority of whom are negroes. The latter are decidedly superior in appearance and character to the ordinary negro type. They are thoroughly French in manner and customs, and even in speech, and the women are notable for cleanliness, but their morality is not of a high order. In form the island is irregular, and its surface is very uneven, being generally occupied by conical-shaped mountains, of which one, Mont Pelee, is an exhausted volcano, and has a height of 4430 feet. It contains a great number of streams, which are used to turn sugar-mills, and the coast, being indented by numerous bays and inlets, affords many good harbours. About one-fourth of the surface is covered with dense forests. The climate is moist but healthy, and the soil fertile. The two principal towns are Fort de France (formerly Fort Royal), the capital, and St. Pierre, which is the most populous town. The former is on the north coast, and its harbour is excellent and is defended by two forts. St. Pierre is an open roadstead on the western coast, affording very indifferent shelter to shipping, but it is the principal place of trade in the island, and it is said to be the handsomest town in the West Indies. The staple products of the island are sugar and small quantities of coffee, cotton, cocoa, and cloves.

Martinique was first settled by a party of about 100 men, headed by a French planter, M. Desnambre, from St. Christopher, in 1635. It was taken in 1762 by the English, but was restored at the peace in the following year. In 1794 it was again taken by the English, and again restored to France at the peace of Amiens. It was once more captured by the English in 1810, and finally restored by the treaty of Paris in 1814, since which time it has remained under the dominion of France. At the beginning of 1839 it suffered greatly from an earthquake. Slavery was abolished by the French Republic in 1848.

**MAR'TINMAS**, the feast of St. Martin, occurs on 11th November. It was the great slaughtering time among our forefathers for swine and other meats for salting, whence the proverb, "Martinmas comes to every hog." Frequently the festival is called *Martlemas*. The Michelmas goose, now so favourite a dish, originally belongs to Martinmas, and was transferred to the earlier festival in the sixteenth century. Black-puddings were another special delicacy at Martinmas, as of course was natural from the quantities of blood derived from the slaughtering of the winter's provision.

**MARTYN, HENRY**, a celebrated English missionary, was the son of a mine agent, and was born near Truro in Cornwall, in 1781. He was educated at the grammar-school of Truro, and entered St. John's College, Cambridge, in 1797, where he prosecuted his studies with such ardour and success that he became senior wrangler in 1801. At the university he came under the influence of the Rev. Charles Simson, whose curate he became. Being resolved to devote himself to the work of a Christian missionary, he went out to India in 1805 as military chaplain in the service of the East India Company. He was stationed at Dinapore, where he preached to the natives as well as the soldiers, established and superintended schools for their instruction, and worked diligently at the translations of portions of the Scripture into the Hindustani and Persian languages. In 1809 he was removed to Cawnpore, where, although he suffered greatly from the heat, he laboured with unremitting zeal both as a preacher and a translator. In 1811 he proceeded to Persia and made a stay at Shiraz, where he occupied himself in religious discussion with the Mohammedan doctors, and in revising, with the aid of some learned natives, his Persian and Arabic translations of the New Testament. Having gone to Tabriz for the purpose of presenting the Shah with his translation, he was there seized with fever, and as soon as he was able to travel he was compelled to seek a change of climate. Cruelly hurried on by his guide he proceeded as far as Tokat in Asia Minor, where he died either of the fever or the plague, 16th October, 1812, in his thirty-second year.

As a translator his work was of the highest value, while his learning, piety, zeal, and devotedness have earned for him a place in the foremost rank of Christian missionaries. (See Sargent, "Memoir of the Rev. Henry Martyn, B.D." 1819; Wilberforce, "Journals and Letters of the Rev. Henry Martyn," 1837; and *The Church Quarterly* for October, 1881).

**MARTYR** (Gr. *martyr*, a witness), a term by which we now generally understand a person who suffers death rather than prove false to his religious convictions. In early ecclesiastical history we find many records of the sufferings and death of Christians, who when prosecuted by the pagans preferred death to apostasy, and by their fortitude and heroism did much to spread their system of religion in the world. Very soon an opinion arose that special merit belonged to all such persons, and great honour was paid to them by their brethren before they were executed, their relics were cherished and preserved, and when the tide of persecution had spent its force churches were erected over their tombs. The blessing of immediate admission to paradise which Mohammed promised to all who fell in battle for Islam, was in the early days of the Christian church awarded to all those who endured the pains of martyrdom, and very soon the custom of invoking their intercession arose, together with that of celebrating the anniversary of their death. It is very difficult to ascertain the number of martyrs who suffered in the early persecutions. The old historians dealt somewhat freely with numbers as a rule, and there can be no question that some of the ecclesiastical writers present very exaggerated estimates. By some modern historians, on the other hand, the number has been unduly minimized. When Christianity became the dominant power in the Roman

Empire, and it became customary to persecute those who advocated heretical opinions, the orthodox party denied that a heretic could be a martyr, inasmuch as he did not die in defence of the true faith, but such persons were naturally honoured as martyrs by their own party. This usage has prevailed until modern times, and we find in the works which have been written since the Reformation the term martyr is used with certain limitations. In Protestant histories all those who were put to death by the Roman Catholic party are spoken of as martyrs, but the Roman Catholics who lost their lives in a similar way are not so referred to, and a corresponding limitation, only on the opposite side, may be observed in the works of Roman Catholic writers. At the present day the term is now chiefly used to designate Christian missionaries, irrespective of denomination, who are put to death by the people among whom they labour. In a still more general sense the word is used in speaking of those who sacrifice their lives at the call of duty in any way.

**MARTYR, PETER**, a famous reformer whose family name was Vermigli, was born at Florence in the year 1506. He became an Augustinian monk at Fiesole, and afterwards taught at Padua University. Study of the writings of Luther and Zwingli converted him, and he fled from the persecution of his brother monks to Zurich in 1542. He became professor of divinity at Strasburg, and was transferred from that university to the chair of theology at Oxford by the invitation of Crammer in 1549. The accession of Queen Mary in 1553 forced him to resign his chair, and he went back to Strasburg. In 1556 he was appointed to a professorship at Zurich, where he died in 1562.

**MARTYROLOGY** is the name given to that department of ecclesiastical history which relates to the acts and deaths of martyrs, a particular arrangement or catalogue being called a *martyrology*. The corresponding word in the Greek Church is *menologion* or *analogion*. The custom of paying honour to the martyrs and of celebrating the anniversaries of their deaths soon rendered the drawing up of such lists necessary, and we find Eusebius referring to a work of this kind drawn up by himself, though the work itself has not come down to us. Many such lists were drawn up during the later patristic times and during the middle ages, and the great "Martyrologium Romanum," designed for the use of the whole Catholic Church, was published by Baronius at the command of Pope Gregory XIII. in 1586. An enlarged edition of this work by Rosweyde appeared at Antwerp in 1613.

**MAR'UTS, THE**, are the Hindu counterparts of the Ogres of the Norse mythology. They are described in the Vedas as roaring among the forest trees and tearing up the clouds for rain. The name of these storm-gods means in Sanskrit the crushers, and it is of the same root as the Greek *Arēs* and the Latin *Mars* or *Maurus*.

**MAR'VELL, ANDREW**, a celebrated English patriot, and an acute, learned, and witty satirist, was born in 1620. His father was master of the grammar-school, and lecturer of Trinity Church, Hull. At fifteen Marvell was sent to Trinity College, Cambridge. Shortly after the death of his father in 1610, he quitted college and went to the Continent. In 1657 he was associated with Milton in the office of Latin secretary to the Protector, with a salary to each of £200 per annum. He was chosen by the citizens of his native town to represent them in the Convention or "healing" Parliament of 1660; but how far he approved of its proceedings in restoring Charles II., without any security against arbitrary and unconstitutional policy, cannot now be ascertained. We learn, however, that at this time he generously interposed on behalf of Milton, who had been committed to the custody of the sergeant-at-arms; and when "Paradise Lost" was published, he had the courage to greet the immortal epic with a copy of eulogistic verses. Marvell continued to represent Hull as long as he



lived. He wrote daily to his constituents during the sitting of Parliament, and frequently at other times communicated full information respecting public affairs. So much was he esteemed that his services as member of Parliament were paid for by his constituents. At the commencement of his parliamentary career, Marvell was far from being unfriendly to the court; but the arbitrary proceedings and licentious lives of Charles and his ministers completely alienated the honest and public-spirited senator, and during the remainder of his career he acted with a small band of patriots, who cautiously, but firmly, resisted the unconstitutional policy of the government. No means were omitted to win over so powerful an opponent; but Marvell's integrity was proof alike against danger and against corruption. He equally despised threats and bribes. In 1678 he wrote "An Account of the Growth of Popery and Arbitrary Government in England," which so provoked the government by its truth and biting satire, that a reward was offered for the discovery of the author, printer, or publisher of what was termed "seditious and scandalous libel." No prosecution, however, took place. Marvell died shortly after, 16th August, 1678. The corporation of Hull voted a sum for his funeral and a monument. A handsome statue of him was erected at the entrance of the town-hall in 1868.

**MARY I.**, Queen of England, was the daughter of Henry VIII., by Catharine of Aragon, and was born at Greenwich on the 18th or 19th of February, 1516. Of several children of this ill-fated marriage the sickly Mary was the only one who survived. It was this fact which (at all events outwardly) gave the foundation for Henry's doubt as to the legality of his marriage, as Catharine had been married to his elder brother Arthur, who died while yet a youth. On the king's second marriage Mary was declared illegitimate, and again so declared in 1536. She was brought up from her infancy in a strong attachment to the ancient religion, but was induced, from motives of self-preservation, to comply outwardly with the reforms of her father. Her adherence to the Roman faith finally induced her Protestant brother, and predecessor on the throne, Edward VI., to attempt to exclude her from the succession. The attempt failed, and Lady Jane Grey paid at the block the price of her few days of queenhood by Edward's nomination.

Mary was scarcely seated on the throne when she proceeded to re-establish the ancient religion. The indications given by the court of a determination to be completely reconciled with Rome were followed by an insurrection headed by Sir Thomas Wyatt, January, 1554, which was in a few days effectually put down. Its suppression was followed by the executions of Lady Jane Grey, her husband, and father, and finally of Wyatt himself; and Elizabeth was for some time confined in the Tower by her sister, who feared her steady, moderate Protestantism.

On 25th July Mary was married to the Prince of Spain, afterwards Philip II., though the prince was eleven years her junior; and the reunion with Rome was completed by a Parliament which assembled in the beginning of November, and which passed Acts re-establishing the whole national system of religious policy as it had existed previous to the first innovations made by Henry VIII. Mary steadily endeavoured, but vainly, to get Philip recognized as joint sovereign with herself. Coins were struck as under Philip and Mary, proclamations were so issued, &c.; but the Parliament steadily declined to further his coronation. The remainder of the history of the reign of Mary is occupied chiefly with the persecutions of the adherents to the reformed doctrines. [See REFORMATION, HOOPE, LATIMER, RIDLEY, CRANMER, &c.] On the most moderate calculation, and making every reasonable allowance, it will be found that in the space of four years 277 persons perished in the flames for religious opinion. The principal

political result of the Spanish alliance was the loss of the town of Calais, the last of the English possessions in France. Mary died, 17th November, 1558, and was buried in Westminster Abbey. She left no issue, and was succeeded by her half-sister ELIZABETH.

**MARY II.**, Queen of England, was daughter of James II. by his first wife, Anne Hyde, a Protestant. Mary and her sister Anne were brought up in the reformed faith, and remained Protestants, although their father returned to the Roman Catholic faith. She was born 30th April, 1662, and married her cousin, William, prince of Orange, 4th November, 1677. When James II. abdicated on the arrival of the Prince of Orange, at the invitation of the chief men of the kingdom, it was at first proposed to give the crown to Mary, who had followed her husband to England (February, 1689), and to acknowledge William as prince consort; but neither Mary nor William would consent to this, and they were declared joint sovereigns (the administration being in William's hands) by the Convention, 13th February, 1689, and crowned on 11th April. In 1690 William's Dutch stadtholdership calling him abroad, Mary was appointed sole ruler in his absence then and for the future. She died of small-pox, 28th December, 1694, and was buried in Westminster Abbey. Some highly interesting letters of hers were published in the year 1885. Mary was tall and well proportioned, and though not beautiful, had a very frank and pleasing expression, which made her very popular, and indeed was of infinite service in counteracting the effect of the cold, rather forbidding manners of her husband.

**MARY STUART (or STEWART), QUEEN OF SCOTS**, was the daughter of James V. of Scotland, by his French wife, Mary of Guise. She was born probably on the 11th or 12th of December, 1542, at a time when her father was on his deathbed, and she became Queen of Scotland when she was only a few days old, the ceremony of coronation being performed 9th September, 1543. She was the unconscious instrument of bringing misfortune upon her country even while an infant, for Henry VIII. of England demanded a treaty of marriage between her and his son Edward, and when the promise made by the Regent Arran was patriotically annulled by the Scottish Parliament, the troops of Henry invaded Scotland, and at Pinkie Cleuch, 10th September, 1547, disastrously defeated the Scottish army. The aversion to a match with England, however, was unconquerable, and Mary, as a relative of the powerful and ambitious house of Guise, was offered in marriage to the eldest son of Henry II. of France and Catharine de Medicis. This offer was accepted, and Mary was in July, 1548, conveyed by a French fleet from Dunbarton to France, the shores of which she reached in safety on 15th August of the same year. Her next ten years were passed at the French court, where she was carefully educated, and where she developed into a beautiful and accomplished woman. She had for her instructors some of the foremost scholars and men of letters of the time, and there is abundant evidence that she turned their instructions to good account in the acquisition of learning and literary and musical skill. But the court of France at this period was in spite of its brilliancy a moral cesspool of licentiousness, treachery, and murder, and it was hardly possible that she should escape its contaminating influence. Her marriage to the Dauphin Francis was celebrated with great pomp at Paris, 14th April, 1558. In the terms of the union every precaution had been adopted by the Scottish Parliament to secure the independence of the kingdom of Scotland, but previous to the marriage Mary was induced to subscribe to some secret deeds, whereby it was provided that if she died childless her Scottish realm, and her right of succession to the crown of England (she being the great-granddaughter of Henry VII.), were conferred upon the king of France. Soon after her marriage the titles of Queen and King of

England were assumed by Mary and her husband on the ground of Elizabeth's alleged illegitimacy, a circumstance which excited fierce resentment in the mind of the English queen, and ultimately exercised a disastrous influence upon the fortunes of the Scottish princess. On the death of Henry II., 10th July, 1559, the husband of Mary became King of France under the title of Francis II., but he died 6th December, 1560, and Mary was left a widow at the age of eighteen.

Meanwhile Scotland had passed through a period of fierce internal strife, during which Roman Catholicism had been compelled to give way before the progress of the Reformation, and Protestantism had been proclaimed as the religion of the country. Mary of Guise, the queen-dowager of Scotland, died 11th June, 1560, and now that her daughter had become a widow the Scottish Parliament invited her to return to her own kingdom. It agreed with the ambitious plans of the French court that Mary should be seated on the Scottish throne, and in August, 1561, she left France for Scotland. Elizabeth had refused her a safe-conduct through England, and had even sent out some ships of war to intercept her, but she arrived at Leith in safety 19th August, 1561, after an absence of thirteen years. Her return was greeted with enthusiasm by the greater part of the nation, and at the outset her remarkable beauty, graceful manners, and varied accomplishments, won the hearts of her people, and caused them to be most favourably disposed towards her. Her first actions also were marked by great prudence and moderation. She assented to the maintenance and endowment of the new creed, surrounded herself with Protestant advisers, chief among whom were her illegitimate brother, James Stuart, and William Maitland of Lethington, only stipulating for the undisturbed exercise of her own religion in her private chapel. An insurrection on the part of the Earl of Huntly was easily put down in 1562, and after his execution she conferred the earldom of Moray upon her illegitimate brother James. The same year, however, a grave scandal was brought against her fame by the arrest of the French poet Chastelard, who was detected visiting her chamber at night, and who was put to death in the November of that year.

There were at this time many applicants for the hand of the queen, several of the monarchs of Europe being anxious to secure the throne of Scotland, while in Scotland itself the Earl of Arran had become a snitor, and Elizabeth of England had proposed her own favourite, the Earl of Leicester. Mary, however, chose her first cousin Henry, Lord Darnley, son of Matthew Stuart, earl of Lennox, and Lady Margaret Douglas. He was, through his mother, among the nearest heirs to the English crown, was a Roman Catholic and good looking, but he was passionate, overbearing, and insolent, weak in understanding, and depraved in morals. Carlyle speaks of him as an "unfledged booby and bastard," and says that he lives in history by virtue of his blubs. Mary was secretly married to him in the apartment of Rizzio, her secretary, in April, 1565, and on 29th July, 1565, they were publicly re-married at Holyrood. Scarcely had this inauspicious union taken place when Mary was called on to encounter an insurrection raised by Moray, Argyll, Glencairn, and others, on behalf, as they alleged, of the Protestant religion and the Scottish constitution. The insurgents received some monetary help from Elizabeth, but when in October, 1565, Mary marched against them at the head of 18,000 men, their forces dispersed and the leaders took refuge in England, only to find themselves disavowed by Elizabeth and rebuked for their rebellious conduct. In this strait Moray and the other leaders endeavoured to make terms with the queen. Just at this juncture two French envoys arrived with a copy of the league which had been signed by the kings of France and Spain for the extirpation of Protestantism, and under Roman

Catholic influence Mary also signed the league, and resolved at the next meeting of Parliament to procure the attainder of the defeated Protestant nobles.

Meanwhile the weak, vicious, and headstrong Darnley had taken deep offence at being refused the crown matrimonial, and had moreover contracted a bitter hatred to Rizzio, with whom he had formerly been upon terms of intimate friendship, but whom he now regarded as an enemy and the cause of his request being refused. It has been said also that jealousy formed an element in the hatred which Darnley felt for Rizzio, but concerning this different accounts have been given. At any rate, it is certain that Darnley entered into a conspiracy with the defeated nobles, and signed a bond whereby he bound himself to obtain for them pardon and restoration, and they agreed to remove Rizzio and support Darnley in his aspirations towards the crown. On the 9th of March, 1566, the palace of Holyrood was invested by the soldiers of Morton. Several nobles rushed into Mary's apartment, and while Darnley held back the queen, Rizzio was dragged from her presence and stabbed to death. The nobles then demanded that Mary should sign a bond for their security, but she managed to detach Darnley from his accomplices, and hastily retired with him to Dunbar. At the end of March they both returned to Edinburgh at the head of a force under the command of the Earl of Bothwell, and the confederate nobles fled the country. Darnley was allowed to protest his innocence, and on 19th June, 1566, three months after the murder of Rizzio, a son was born to Mary, who was named James Charles. In him, as James VI. of Scotland and James I. of England, the two crowns were afterwards united.

Mary's hatred for Darnley, however, now became intensified by her growing affection for Bothwell, upon whom she heaped many honours, and when the enemies of Darnley, with Bothwell at their head, hinted at divorce they found a ready listener in the queen. In the beginning of 1567 Darnley was taken suddenly ill with the small-pox at Glasgow, and was brought by easy stages to Edinburgh, where he was lodged in a lonely house beside the Kirk of the Field. There he was visited by Mary daily, and she spent the Sunday evening of 9th February in his room, leaving him at night to take part in a masque at Holyrood. About two hours after midnight the house was blown up by gunpowder, and next morning the bodies of Darnley and a page were found in an adjoining garden, where they had been strangled while trying to make their escape. That Mary had good cause to hate her husband has been abundantly proved, and some additional information as to his coarseness and brutality has been recently given in the publication of the diary of Claude Nau, one of Mary's secretaries (Edinburgh, 1883), but opinion has always been divided as to whether she was privy to his murder. A similar difference of opinion exists in reference to her conduct during the few months which followed this event; the facts which have been established beyond controversy being as follows:—The day following the event a reward of £2000 was offered for the discovery of the murderers, and immediately the streets of Edinburgh were placarded with notices denouncing Bothwell by name. The father of Darnley demanded that Bothwell should be put upon his trial, and when it became evident that this demand could not be resisted, Bothwell appeared before the Privy Council on 12th April, having occupied the streets with 4000 armed men, and having the castle also under his command. His accuser, Lennox, hearing of these preparations, did not appear, and Bothwell was promptly acquitted. On the 19th April Bothwell obtained the signatures of some of the leading members of the Scottish Parliament to a deed in which they recommended the queen to reward his services by giving him her hand. On the 24th April, at the head of a troop of horse, he waylaid the queen on the way to Edinburgh,

and carried her off to Dunbar Castle. On the 7th May he was divorced from his own wife, Lady Jane Gordon, to whom he had been married about a year, and the same day he returned with the queen to Edinburgh, where she proclaimed his pardon for the abduction, soon afterwards creating him Duke of Orkney. Three days later, on 15th May (three months and six days after her husband's murder) she married the man who by the public voice had been unanimously proclaimed his murderer.

As soon as it had become evident that Mary had resolved to marry the Earl of Bothwell, a party had been formed among the nobles for mutual protection against him. A few weeks after the marriage they rose in arms, and announced their intention to separate the queen from her husband. Mary and Bothwell at first retired to the Castle of Dunbar, and from there they passed to Haddington and thence to Seton, where they succeeded in gathering a small army. The opposing forces met on 13th June, at Carberry Hill, 6 miles from Edinburgh, and while negotiations were being carried on most of the royal army disbanded, and Mary was compelled to surrender to the confederates, while Bothwell was allowed to ride off the field with such of his followers as had remained faithful. Mary was taken to Edinburgh, where she was received by a mob of the populace who heaped upon her every insult within their power, so that she became half frenzied with grief and anger. Next day she was conveyed to Loch Leven Castle, where, on 24th July, she was prevailed upon to sign an act of abdication in favour of her son, and to appoint Moray regent, a commission of regency being also named until Moray could return from France. She remained a prisoner at Loch Leven until 2nd May, 1568, when, by the assistance of two members of the Douglas family, she was enabled to escape, and in a few days she found herself at the head of an army of 6000 men. On the 13th May her army was defeated at Langside by the forces under the regent Moray, and Mary fled from the field. Three days afterwards she crossed the Solway and landed at Workington in Cumberland. On the 15th July she was removed by the orders of Elizabeth to Bolton Castle, and during the autumn of the year, having submitted her cause to the arbitration of Elizabeth, conferences were held, first at York and afterwards at Hampton Court, between the commissioners sent by Moray and those of Mary and Elizabeth. By Moray she was charged with complicity in the murder of Darnley, and a number of letters were produced which it was said left no doubt of her guilt; but Mary denounced these as forgeries, and in the end, after sitting for five months, the conference terminated without any definite decision in favour of either party, though it left Mary in captivity and in the power of Elizabeth.

At this period Elizabeth was the chief protectress of Protestantism in England, and also its strongest champion in Europe, and in consequence she was the object of the bitterest hostility on the part of the Roman Catholic party. Many of the members of the latter regarded Mary Stuart as being the legitimate successor of Mary Tudor as queen of England, and she had not been in the kingdom a year before an intrigue was entered into by many influential English nobles for the restoration of the Scottish queen to liberty, and her marriage with the Duke of Norfolk, leader of the English Roman Catholics. This was soon discovered; and Mary was committed to Sheffield Castle, where she remained a prisoner under the care of the Earl of Shrewsbury from 1570 to 1584. Various plots were entered into during this period by the Roman Catholic party for the purpose of dethroning Elizabeth and transferring the throne to her rival. These intrigues, however, were all discovered by the penetration and activity of the English ministers. In 1572 a scheme for the invasion of England by Spain on behalf of Mary, who was also by this scheme to take the Duke of Norfolk for her husband, was discovered;

and the duke was now tried and executed for his share in the plot. The same year Elizabeth, who had refused her assent to the demand for the trial of Mary made by Parliament, endeavoured to enter into a treaty with the Earls of Mar and Morton in Scotland, by which Mary should be sent back there and immediately put to death, but the negotiations fell through, and her life was spared a few years longer.

The plotting against Elizabeth's life and crown, however, still went on, and after sundry schemes had been discovered, in 1586 Mary was charged with being concerned in a conspiracy designed by Antony Babington for the assassination of Elizabeth and restoration of Roman Catholicism by means of a foreign landing and an internal rising. For this Mary was put upon her trial at Fotheringhay Castle in October, 1586, and though alone and unaided by counsel she defended herself damtlessly, and with wonderful ability, denying with indignation any knowledge of the intended murder of Elizabeth. In the end she was found guilty and condemned to death. She received the news of her condemnation with unflinching courage, and though three months elapsed before it was carried into execution she preserved her composure to the end. Elizabeth was in dire perplexity as to carrying the sentence into execution. Some historians assert she tried to get her ministers to act without her orders, which however they carefully avoided doing; it is also sometimes asserted that on trial she found Sir Amias Paulet, the keeper of Mary, equally unwilling to despatch his prisoner secretly. But these things are uncertain. Not so her prolonged hesitation, which is well established. At last she signed the warrant for Mary's execution, and on the 7th February, 1587, with calm and dignified courage, Mary met her death at the hands of the headsman. Five months afterwards her body was removed to Peterborough, whence in 1612 it was taken to Henry VII.'s Chapel at Westminster, where it still lies in a sumptuous tomb erected by King James I.

Perhaps there is no character in history which has been the occasion of so much debate as that of Mary Queen of Scots, and though now some three centuries have passed since she bowed her neck beneath the axe of the executioner, the interest of the question shows no sign of abatement. By many writers Mary has been held up as being sensual, vindictive, treacherous, unpatriotic, and unscrupulous, one who used great abilities for selfish and evil ends, and whose early life at least was stained with impurity and murder. On the other hand the romance of her life, her beauty, her wit, her gaiety, her hard surroundings and sufferings, her courage, fortitude, and tragical end have raised up for her a host of defenders, who have striven with enthusiastic devotion to vindicate her character from the charges laid against it. The books that have been written in Great Britain and upon the Continent in reference to her would be sufficient to fill a large library, and historians and essayists are still busy with the subject. As the case stands at present in the matter of the gravest charge of all—viz. her alleged implication in the conspiracy for the murder of Darnley and her criminal love for Bothwell, the evidence certainly preponderates against her, and it is also unquestionable that her presence in England during the nineteen years of her captivity was a constant source of danger, alike to Elizabeth, to England, and to the cause of the Reformation. Among the later writers upon the life of Mary, the reader may consult Hosack's "Mary Queen of Scots and her Accusers" (1869); Green's "Short History of the English People" (1875); Froude's "History of England" (1856-70), and the work of Claude Nau, with its appendices, already referred to. See also the articles under BOTHWELL, ELIZABETH, KNOX, &c.

**MARYLAND**, one of the United States of North America, is divided into two portions by Chesapeake Bay and the Susquehanna. That portion which is east of the bay is bounded south by Virginia and east by the Atlantic

Ocean and Delaware. Pennsylvania forms the whole northern boundary of this state, and Virginia and the Potomac form the boundary of the rest of the state. The area is 12,210 square miles, and the population in 1880 was 935,139.

*Surface and Soil.*—On the eastern shore, and in some counties on the western, the soil is a mixture of clay and sand, not very fertile, but easily improved by manure, which is found in extensive beds of marl abounding in the district. The country near the sea is level, but on the west there are some hills. The line of the Atlantic coast is only 33 miles, but including Chesapeake Bay is 411 miles.

*Rivers.*—The Potomac rises within the Appalachian Mountains, with two branches: the northern branch rises in 39° 12' N. lat., on the eastern declivity of the Backbone range. Twenty miles below Cumberland it is joined by the southern branch, which rises in the centre of Virginia, about 38° 25' N. lat. After this junction the Potomac flows south-east and south till it falls by a wide estuary into Chesapeake Bay. The river is navigable to the city of Washington. It is 10 miles wide at its mouth and a mile at Alexandria, to which place it is navigable for vessels of the largest class. The Patuxent is 90 miles long, and is navigable for 50 miles by vessels of 250 tons burden. The Patuxent is a small river navigable to Baltimore. The Susquehanna traverses the northern part of Maryland for 15 miles before it falls into Chesapeake Bay.

*Climate and Productions.*—The climate is rather mild in the level part of the country, but the winter is sometimes severe enough to block up the harbour of Baltimore with ice for some weeks. Rain is rather abundant; drought is rare.

The state of Maryland, though of comparatively small size, is rich both in an agricultural and mineralogical point of view. The principal crops grown are wheat, Indian corn, and tobacco. The other products are barley, oats, honey, silk, wool, maple sugar, and timber of many kinds. The system of cultivation by tenants is, as a rule, made to correspond to the best-known system of farming, and penalties for departure from the recognized system are provided in the contract. The rotation of crops is generally Indian corn, wheat, then fallow, three fifths only of the land being in cultivation at one time, and permanent meadows considered as land under cultivation. The whole country was originally covered with a dense forest, of which but still remains.

Coal holds the first place in importance among the mineral riches of the state. There are three distinct fields or basins, but the only one worked is the Potomac or Cumberland coal-field, the produce of which is of excellent quality, being very free from gas, and admirably adapted for steam purposes. Iron ores exist in great abundance throughout the state, and there are also several copper mines. Lead, cobalt, alum, lime, manganese, and gold are also found.

The state possesses great facilities both for foreign and internal trade, having the Chesapeake Bay, navigable for the largest vessels, extending through the heart of its territory, and its south-western shores washed by the Potomac and the Susquehanna.

*History and Constitution.*—Maryland was first settled as a place of refuge for the persecuted Roman Catholics of England by Lord Baltimore in 1634, and the country received the name of Maryland from Henrietta Maria, the wife of Charles I. It was admitted into the Union in 1788, but the constitution of the state was remodelled in 1851. In the Civil War the first blood was shed in Maryland, several Massachusetts volunteers having been killed at Baltimore on their way to Washington. The sympathies of the state were with the Confederates, but its position with reference to the seat of the Federal

government caused it to be occupied by a strong military force, and placed under martial law. It was repeatedly invaded from Virginia and made the scene of several bloody conflicts.

**MARYPORT**, a seaport of England, in the county of Cumberland, on the river Ellen, 5 miles north-east of Workington, and 815 from London by the North-western Railway. In 1750 there was only one building on the present site of the town, and the place was called Ellenfoot. The houses, consequently, are all modern, and the town is well paved and has a good supply of water. On account of its salubrity it is much resorted to for bathing during the summer. In addition to the church there are places of worship for nearly all classes of dissenters; a town-hall, an Athenaeum, containing a handsome music hall and apartments for the literary institute, and an observatory, from which some fine views may be obtained. The town has excellent railway facilities, and the trade and manufactures connected with shipbuilding are in a flourishing state, and it is the chief centre of the coal exportation of the county. Blacklead pencils are also made, and there are several iron foundries and large corn-mills. The market is held in an open space in the centre of the town, and is well attended. The vessels belonging to the port are chiefly employed in exporting coal and lime, and in importing cattle, timber, flax, and iron ore. The coals are chiefly sent to Ireland. Steamers for passengers and goods ply regularly to and from Liverpool. A new dock was opened in 1884, which covers 54 acres and cost over £200,000. The number of vessels registered as belonging to the port in 1888 was seventy-five (25,000 tons). The entries and clearances each average 1600 (220,000 tons) per annum. The population of Maryport in 1881 was 8126.

**MASACCIO** (the nickname of Tommaso Guidi, roughly translatable as "foolish Thomas," and given him because of his neglect of his personal interests) was born at San Giovanni in Val d'Arno, in the year 1401, and died at Rome in 1429. He was a disciple of Masolino da Panicale, to whom he proved as much superior as his master was to all his contemporaries. His most perfect works are the frescoes of the Brancacci chapel in S. Pietro del Carmine at Florence. He entered the painters' guild at Florence in 1421, and soon after began upon the frescoes. They mark an epoch in art. All the great artists for a hundred years afterwards formed their style upon them. Michelangelo studied them closely. Masaccio was the first to aim at fresco-pictures apart from the mere purposes of decoration, and also apart from the rigid adherence to religious symbolism hitherto prevailing. Bold design and firm contrasts of light and shade found their first great exponent in him.

**MASAI LAND**, a country of Eastern Africa, situated between the Kilimanjaro and Kenia Mountains and the eastern borders of the Victoria Nyanza. The region is, as a whole, a high table-land, from 3000 to 5000 feet in height, with great mountain ranges and isolated masses rising above it to a height of from 10,000 to 19,000 feet over the sea-level. The most striking of these are the double snow-clad peaks of Kilimanjaro on the one side, and on the other the great dome from which pyramidal Kenia shoots its hoary head skywards. Everywhere there are signs of immense volcanic activity, an activity which is not yet quite extinct, if steaming lakes and crevices are any evidence. The rainfall is strangely capricious, and at the best scanty; and while some parts are traversed by fine rivers with great waterfalls, others are absolutely waterless. But for this the soil would be very fertile. The vegetation has a wide range, northern trees and plants, such as pine-woods, heathers, and brambles being found, together with others whose nearest congeners dwell as far south as the Cape. Lions, elephants, hippopotami, buffalo, hartbeest, and deer of all kinds, and smaller game of every variety

are abundant. Though the region is to a great extent desert, it is simply due to the fact that it is unwatered by streams and scantily endowed with rainfall. There are none of the swamps and rotten vegetation which make the coast and lake regions elsewhere so deadly to the European constitution.

The land of the Masai lies just on the meeting-ground of the three great races into which linguistic ethnology has divided the African people. On the north and north-east there are the races of Hamitic speech, whatever may be their real ethnological affinities; on the south begins the great Bantu stock, which is spread over so large an area of Central and Southern Africa; while on the west we find the somewhat heterogeneous races which ethnologists designate negro because they know so little about their real affinities. It is probable enough, then, that these Masai are really a mixed race, though from their appearance and their language it would seem as if they were more nearly allied to the Gallas than to any other stock. In build, in bearing, in clothing, in habits, and in pursuits they differ in many notable respects from any other African people. Their bearing is haughty and fearless; their demeanour in meeting even so utter a stranger as a white man as cool as that of the typical American Indian, though, unlike him, they lose their self-restraint, even in the presence of strangers, to scramble for a handful of beads. It is the bachelors who seem to do the most of the fighting, and who, while unmarried, must not taste vegetable food. They pray to a kind of pantheistic deity. There seem to be degenerate Masai mixed up in little colonies with the overbearing lords of the soil, or living on the outskirts of Masai Land where they have lapsed into agriculture. One branch has been driven westwards to a fertile district near the north-east shore of lake Victoria Nyanza, where they have been compelled to take to agriculture. These people are gentle, honest, and apparently more civilized than the warlike cattle reivers to the east.

("Through Masai Land: a Journey of Exploration among the Snowclad Volcanic Mountains and Strange Tribes of Eastern Equatorial Africa," by Joseph Thomson, F.R.G.S., London, 1885.)

**MASANIELLO.** See ANIELLO.

**MAS'CLE** (Old French, from Lat. *macula*, a spot, or a mesh of a net), a lozenge-shaped form. One variety of old armour was made up of mascles of iron on a quilted tunic. Masceled armour is seen in our plates of coloured illustrations to the article **BAVUX TAPESTRY**. The term passed into heraldry, where it means a voided (that is, perforated) lozenge.

**MASH'AM, ABIGAIL**, was the daughter of Francis Hill, a merchant of London, who married the aunt of the Duchess of Marlborough. Her relative, then Lady Churchill, procured her the place of waiting-maid to the Princess Anne. She retained her situation after the princess ascended the throne, and acquired great influence over her. Miss Hill married Mr. Masham (son of Sir Francis Masham of Otes in Essex) in 1707. Harley, afterwards Earl of Oxford, connected himself with the new favourite; a change of ministry took place, and in 1711 Mr. Masham was raised to the peerage. He and his wife appear to have been engaged in the intrigues of the Tories in favour of the exiled House of Stuart. Lady Masham lived a long time after the death of the queen, and died at an advanced age, 6th December, 1781.

**MASH'ING.** See **BEER, DISTILLATION**.

**MASINIS'SA**, a Numidian prince, originally a vassal of Carthage, and fighting for that city in Spain against the two Scipios and the armies of Rome. Their crushing victory in B.C. 206 led the crafty and unprincipled Numidian to cast in his lot with the invaders. With them he invaded his former allies, increased his territory, and at last powerfully aided in the battle of Zama, which for ever

destroyed the power of Hannibal and of Carthage. He commanded the cavalry on the Roman right wing in this famous fight. The Romans in gratitude confirmed him in his large conquests, and he became the most powerful monarch in Africa. There is reason to think that he intrigued for Roman permission to annex Carthage itself; and certainly it was not long after the departure of the Roman legions that he was in arms and victorious against the humbled city, now a mere wreck. The Romans intervened to prevent his conquests going too far, but purposely stopped short of commanding him to live peacefully, as it was in their interest that Carthage should be harassed. They declared the third and last Punic War in B.C. 149, and Masinissa was purposing to help them to blot out Carthage from the map (*delenda est Carthago*) when he died B.C. 148, aged 90 years. His son Micipsa succeeded him; and after Micipsa came the famous **JUGURTHA**, hero of the fascinating history of Sallust.

**MAS'KELYNE, NEVIL**, Astronomer Royal, was born in London, 6th October, 1732, and educated at Westminster and Trinity College, Cambridge. In 1755 he took orders, but he had previously been led to turn his attention to astronomy by the solar eclipse of 1748, and by his acquaintance with Bradley, whom he assisted in the formation of his tables of refraction. In 1761 he went to St. Helena to observe the transit of Venus, and to detect, if possible, the parallax of the fixed stars. In this voyage, and in one undertaken to Barbadoes, in 1764, to try the merits of Harrison's new chronometers, he acquired that knowledge of the wants of nautical astronomy which afterwards led to the publication of the *Nautical Almanac*. In 1765 he was appointed to succeed Mr. Bliss as astronomer royal, and from this time, with the exception of his journey to Scotland in 1772, to determine the mean density of the earth by observing the effect of the mountain Schellion, in Perthshire, upon the plumb-line, his life was one unvaried application to the practical improvement of astronomical observation. He died 9th February, 1811.

**MASOLINO**, whose full name was *Masolino* (a form of Tommaso) *da Panicale*, an early Italian Florentine painter (1378-1415), is chiefly remarkable as having been the master of the famous Masaccio, and as having begun in the church of the Carmine that fresco decoration which Masaccio developed into such a noble medium for art. The qualities of freedom, of harmony, and of grandeur without stiffness which characterize Masaccio's work are all to be seen in their beginnings in Masolino. In all respects he made a great advance upon the style of his master, Lorenzo Ghiberti, although he was destined to be himself far surpassed by his pupil.

**MASON BEE** is the name given to several species of bees belonging to the genus *Osmia*, from their habit of making their nests of small grains of sand, beautifully pierced and cemented together by a gummy secretion. Similar habits occur in other bees. See **BEE**.

**MASONS, FREE.** See **FREEMASONRY**.

**MASQUE** or **MASK**, a species of drama which originated in the custom of enlivening processions and spectacles by the introduction of masked persons to represent imaginary characters. Gradually, in England, a dramatic form and poetic meaning were given to these shows, and finally they were performed with the aid of music, machinery, and decoration. They reached their climax of popularity in the reigns of James I. and Charles I., when Ben Jonson invested them with the splendour of his imagination, and Inigo Jones brought his taste and ingenuity to bear upon their stage presentation. One of the finest examples of this class of composition is, however, the work of a severer genius—we allude to Milton's "Comus."

**MASS** (Lat. *missa*, equivalent to *missio*, a dismissal), the English name of the eucharistic service or liturgy as celebrated in the Roman Catholic Church, as well as in the

Orthodox Greek and other Eastern churches. The term *missam facere*, at first employed in the law-courts to indicate the end of a suit or a session and the releasing of witnesses from further attendance, came at a very early period to be employed by the Christian society to designate the "dismissal" of the morning and evening congregations assembled for divine worship. Then the word *missa* was used to designate the service itself; and, finally, it was only applied to the morning eucharistic celebration. In this last sense the word is used by St. Ambrose (Ep. xx. 40). And in this restricted sense, after the fourth century, the word *missa*, or its equivalent in the vernacular, was employed by the Latin Church and all the western nations. During the celebration of the liturgy in the early ages, a double "dismissal" was pronounced, the first at the end of the Gospel or of the homily immediately following the Gospel; and this was called the *missa catechumenorum* or mass of the catechumens, who retired after certain prayers had been recited over them. The remainder of the service, up to the post-communion prayers, was the *missa fidelium*, the mass of the faithful, terminating with the formula uttered by the deacon: *Ite, missa est* (Depart, the congregation is dismissed). So much for the word "mass" and its derivation.

The Council of Trent defines that in the mass a true and proper sacrifice is offered to God. The meaning of this definition is made clear by the doctrine of the Roman Catholic and the Eastern churches with regard to the Eucharist, in which they believe that, after the consecration, the body of Christ is really present on the altar under the form of bread and his blood under the form of wine. The consecration of these separate elements, by thus dividing the sacramental body from the blood, represents the death of Christ, the slaying of the divine victim, when all his blood was poured forth for us. This unbloody but real sacrifice and oblation, Roman Catholics say, Christ commanded to be perpetually renewed in memory of the bloody immolation on the cross. The priest represents Christ's person, speaks at the altar in his name and with his power, while consecrating and offering up the sacrificial elements to the Father. The infinite virtue of Christ's one bloody oblation is thus daily brought home to the mind of believers, and applied unceasingly all over the world to the daily needs of mankind. His sacrifice is one of perpetual atonement, propitiation, thanksgiving, and intercession for both the living and the dead.

The mass, as understood by Roman Catholics, by all indeed who believe in the real presence of Christ in the Eucharist, is not a mere external form of public prayer varying with living languages, with the genius of nations, the framework of political society, or the phases of civilization. It is, by its nature, the most solemn of functions, the most august and sacred of actions. The people in whose name it is offered are taught to understand that it is such an action, so divine a sacrifice. The priest represents them as he does Christ; he speaks in their name, and prays with them and for them. Those who can read have the mass both in the Latin and in the vernacular in their prayer-books, together with the additions proper to the festivals of the Christian year. But even the most illiterate can follow the three essential parts of the eucharistic sacrifice—the offertory or presentation to God of the unconsecrated elements of bread and wine; the consecration of these elements by the priest, acting in the person and using the very words of Christ; and the communion, in which the celebrant consumes the consecrated elements, the people also communicating with him in fact or in spirit. Very beautiful prayers and impressive exercises lead up to, accompany, and follow these three parts or stages in the sacrificial function. As to the language used in the liturgy, it was at first the vernacular of the peoples among whom the early Christian societies were formed. There is reason to

believe that both the Greek and the Latin tongues were used in Rome, in the apostolic age and the following, in the eucharistic celebration, the Greek at length being entirely superseded by the Latin. In the Eastern churches the vernacular is now nowhere used, the liturgies of the different churches being celebrated in tongues which have long ceased to be spoken by the people. Thus these liturgic forms remain as witnesses of the faith of past generations. In all these churches of the East and the West, it is held that no one but a lawfully ordained priest has power to consecrate. This power, they teach, was directly given by Christ to the twelve apostles, to be by them transmitted to their successors in the episcopal office. From such bishops the power is communicated in ordination to the priest, as the great distinctive prerogative of the Christian ministry. The lawful matter used in consecration is wheaten bread and the juice of the grape. The verbal form consists, substantially, in those used by Christ himself in the Last Supper. In the Roman Missal the following is the full form of words: "Who the day before He suffered took bread into His holy and venerable hands, and with His eyes lifted up toward Heaven, giving thanks to Thee, Almighty God, His Father, He blessed it, brake it, and gave it to His disciples saying, Take and eat ye all of this, for this is My body. In like manner, after He had supped, taking also this excellent chalice into His holy and venerable hands, giving Thee also thanks, He blessed and gave it to His disciples, saying, Take and drink ye all of this, for this is the chalice of My blood of the new and eternal testament, the mystery of faith; which shall be shed for you and for many to the remission of sins. As often as ye do these things, ye shall do them in remembrance of Me." Besides the purity of soul obligatory on the priest who celebrates mass, he must also be fasting since the preceding midnight; the same twofold obligation is also incumbent on communicants, the obligation of fasting being only dispensed with in the case of persons in danger of death, to whom the sacrament is administered as *viaticum*, or food for the journey to eternity. The altar table, in the Roman Catholic Church, must either be of solid stone, consecrated by a bishop, or must contain a small stone so consecrated; and it is covered with three folds of pure linen. The corporal, or consecrated cloth on which the consecrated elements are laid, must also be of pure linen. At the high altar of St. John Lateran in Rome is preserved the wooden table on which tradition affirms that St. Peter celebrated the eucharistic sacrifice. On this the Pope alone is privileged to say mass. The vestments used in the celebration are all traced back to those used by priests in the first Christian ages. They vary in colour and richness of material with the festivals of the year. Such being in the Roman Catholic Church the conception of the sacrifice of the mass, it was natural that its celebration should be made an essential part of the observance of the Christian Sabbath. Hence all Catholics are bound to hear mass on Sundays and holidays of obligation. According to the degree of solemnity used in the celebration, a mass is called a private or a low mass, when the priest does not sing any part of it and is only assisted by one or two clerks; it is called a *missa cantata* when the priest sings it without deacon or subdeacon; a solemn or high mass, when sung with deacon and subdeacon. A pontifical mass is that sung by a bishop with the prescribed number of assistants. In the beginning there was but one mass in each church daily, the bishop and priests in cathedral churches celebrating together, in parochial and collegiate churches the priests all uniting in one celebration. This is still the practice in the Eastern churches. In the West the custom was gradually introduced that each priest should celebrate separately. The rule is that no priest should celebrate more than once a day, save on Christmas Day, when all priests are privileged to say three masses. In Spain this privilege is also ex-

tended to 2nd November, or All Souls Day. The necessities of missionary countries alone authorize a temporary departure from this rule. As to the hour of celebration, though the early morning hours were always preferred, there was, up to the fifth century, no fixed or general law. At present this law is that mass must not be said before sunrise or after midday without a special dispensation.

**MASS, MUSIC OF THE.** As originally arranged by St. Ambrose, and afterwards by St. Gregory the Great, the music of the mass was a collection of ancient chants in PLAIN-SONG, and each part of the mass had its special tune, varying with the seasons and festivals.

As music advanced other melodies or counterpoints were added to the original plain-song, and masses were sung in many parts. Since over-elaboration would seriously interfere with much of the divine service, the choral parts of the mass gradually settled down to six selected passages—the *Kyrie* ("Lord, have mercy upon us"); *Gloria* ("Glory be to God in the highest"); *Credo*; *Sanctus* ("Holy, holy, holy," with which is coupled the *Osanna*); *Benedictus* ("Blessed is he that cometh in the name of the Lord"); and *Agnus Dei* ("O Lamb of God"), the latter not being invariably set to music. The ingenuity of composers delighted in using one and the same tune for all these six movements, but so varying it with overlying and accompanying harmonies that not sameness but infinite variety should result. The mass was known musically by the name of the tune upon which it was thus built up, as "Missa Tu es Petrus," &c. Unhappily we find also such curiosities, and that too in numbers exceeding those of the plain-song masses, as "Missa l'Homme armé," "Missa Faysius reges," &c., when a popular song or secular tune is taken, as the "Cantus firmus," and only the accompanying melodies are of an ecclesiastical character. Still more extraordinary is it to find the words of these popular songs actually sung—the tenor being the most usually offending voice, carrying along his roystering tavern song, while the other parts sing the sacred words of the mass. At last, in 1564, the Council of Trent having some years before issued stringent decrees against this burlesque of divine things, Pope Pius IV. set to work to carry out the council's orders, and the commission of cardinals he appointed saw no other way out of the dilemma than by prohibiting all music except the original venerable plain-song chants in the church. St. Carlo Borromeo besought them to stay their hands till his friend Palestrina, choirmaster of Santa Maria Maggiore, had shown them specimens of worthier music, such as he had been lately studying to produce. Palestrina brought to the commission three masses, the first of which was the "Missa Papæ Marcelli," for six voices, dedicated to the last pope, Marcellus II., a good friend to the composer during his life, and this being sung in the Sistine Chapel on 19th June, 1565, at once converted the cardinals from their judgment, and saved music for the church. It is indeed a masterpiece, and when, very carefully and efficiently, produced in London in 1885 (at the ancient concerts in connection with the International Music Exhibition of that year) it was found to sound as majestic and truly sacred as it appears on paper. Probably every musician would admit that it is one of the most perfectly appropriate musical pieces we possess, a real miracle of art.

It is not necessary to trace down the progress of the mass-music; every one knows Bach's wondrous "Mass in B minor," every one knows the so-called "Mozart's Twelfth Mass," which he did not write, and some of those which he did write, while few are unacquainted (and none ought to be) with the two stupendous masses of Beethoven, and the masterpieces of Cherubini.

**MASSACHUSETTS**, one of the United States of North America, lies between 40° and 42° 45' N. lat., and 70° 30' and 73° 30' W. lon. The Atlantic Ocean washes its eastern and southern shores. On the south it is

bounded by Rhode Island and Connecticut, W. by New York, and N. by Vermont and New Hampshire. Its greatest length is about 190 miles, and its greatest breadth 90 miles. The area is 7800 square miles. The population in 1880 was 1,783,086.

The surface of this state is uneven; hilly and broken in the centre, east, and north-eastern parts, and level and sandy in the south-east. The western portion, though mountainous, does not attain to a very great elevation above the sea. Saddle Mountain, the highest land in the state, is 3500 feet; Mount Washington, 2624 feet; and Mount Wachusett, 2018 feet high. The east and south-east coasts are much indented with bays. The principal islands are Martha's Vineyard and Nantucket, which are noted for their whale and other fisheries.

The western and mountainous region is traversed by the Housatonic, which flows south nearly 50 miles, when it enters Connecticut; it is a very rapid river, and not navigable in Massachusetts. The Connecticut enters Massachusetts from New Hampshire. The Merrimac rises in New Hampshire on the western declivities of the White Mountains, and falls into the Atlantic after a course of more than 150 miles. The tide ascends to Haverhill, 15 miles from its mouth, but above it the course of the river is obstructed by several falls and rapids, all of which are now avoided by canals, and an uninterrupted navigation has thus been effected as far as Concord in New Hampshire.

The climate of this state is much colder in winter and warmer in summer, than the southern districts of Great Britain, though the difference of latitude amounts but to about 9 degrees. In the spring it is subject to chilling north-east winds. The mean temperature is 48°, or 2 degrees less than that of London. In January the thermometer falls to 8° below zero; while in June it rises to 98° Fahr. The change of temperature is often 40° in twenty-four hours.

As Massachusetts was early settled, a greater portion of its surface is cultivated than in most of the other states. The soil generally is rocky; and although the most approved systems of agriculture are adopted and pursued with great industry, the corn produced is not sufficient for home consumption. The principal productions are Indian corn, rye, oats, potatoes, hemp, flax, pease, hops, beans, and pumpkins, which last are used as food for swine and cattle. Wheat, buckwheat, and barley are raised only in smaller quantities. All the fruit trees of England are cultivated. The fishery of cod in Massachusetts Bay and on the banks near Nantucket is important. Large quantities of mackerel are likewise taken.

Iron occurs in several places, and limestone abounds in the western parts of the state, where some good marble is found. Near the coast are numerous salt marshes. Much sand is used in glass manufacture. Railways intersect the state, and connect all the large towns.

Massachusetts is one of the most enterprising states of the Union, and has very extensive manufactures of agricultural implements, general machinery, cotton, boots and shoes, and watches. There are also flourishing shipbuilding yards, and at least one sixth of the United States navy has been supplied by Massachusetts. The principal port is Boston, which is admirably screened from the storms of the Atlantic, and is accessible to the largest vessels.

**History and Constitution.**—The first settlement was formed in 1620 at Plymouth, by about 120 families of English nonconformists, who had fled to Holland, and thence proceeded to Cape Cod. It is thus the oldest of the New England states. The American Revolution began in Massachusetts. The first constitution was formed in 1780, and was revised and modified in 1820. The legislature consists of forty senators and 240 representatives, elected for one year. The governor is also elected annually,



Massachusetts sends two senators and twelve representatives to Congress, and has thirteen votes in the election of the president of the United States. Every male citizen of the age of twenty-one years, who has resided one year in the state and six months in his election district, and who has paid a tax within two years, has a right to vote: he must, however, be able to read the Constitution of the state in the English language.

**MASSILLON, JEAN BAPTISTE**, the greatest preacher France has produced, was born 21th June, 1663, and died in 1742. He preached his two celebrated Lent sermons before Louis XIV. and the court at Versailles. Louis said of him, "Other preachers make me contented with them, he makes me discontented with myself."

**MASSORAH, THE**, a term variously derived from Heb. *massar*, to hand down (tradition), and *assar*, to bind or fix (the first being most probably the correct derivation), is the name given to the vast heterogeneous mass of criticisms, explanations, concordances, and notes accumulated by the Jewish rabbis round the sacred text of the Old Testament. In the centuries which immediately followed the edition of the books of the Old Testament prepared by Ezra and the scribes who followed him, a certain freedom seems to have been exercised in respect to the text, and it is evident that the text used by the translators who prepared the Septuagint, as well as that of some other ancient versions, was one which differed in many respects from that now in use. After a time, however, the words of the sacred books came to be regarded with an extreme degree of veneration, and the Jewish scribes busied themselves in devising methods whereby they might be preserved free from all corruption, and by which any error that crept into the text through carelessness in transcription might be at once detected and set right. For this purpose they made careful notes of every archaic form, peculiar expression, spurious or redundant letter or word, and every variation in the spelling of the same words in different parts of the sacred writings. They also counted the number of times that each letter of the Hebrew alphabet occurs in the whole of the Old Testament, in each great section of it, and in each separate book; they also ascertained the middle verse of the Old Testament, and each of its parts, the middle word, and the middle letter. Beyond this they noted how many verses began with particular letters, or began or ended with the same word, or contained a particular number of words or letters, &c., and they drew up lists of the places where a different reading was required in order to understand the true meaning of the original. These variations were known by the technical names of *Keris* and *Chethibs*, *Keri* meaning read, and *Chethib* written. By a variety of methods such as these, they sought to elaborate a system of cross references, minute numerations, and organic combinations by which the sacred text should be preserved to all ages in a state of absolute purity. For a long time the Massorah rested on oral tradition, its treasures being preserved by that prodigious power of memory which we meet with in connection with more than one Eastern system of religion; but at some period, the date of which is unknown, it began to be committed to writing. As it represents the labours of many generations of Jewish scholars, the whole was never committed to one book, but portions were written from time to time on the margins, and at the beginning and the end of the MSS. of the Scriptures. This necessitated the use of abbreviations, and these were gradually developed into a kind of cryptography the secret of which was known only to the scribes, and ultimately only to the most learned among them. As might be imagined, the scribes, whose work it was to mechanically copy a work which they did not understand, would be especially liable to make or pass mistakes, and this indeed happened to such an extent that when the learned Jacob ben Chayim undertook the preparation of an edition of the Massorah for Bomberg's great

Rabbinic Bible of 1521-25, he declared there existed such confusion that there was not a sentence without a blunder; but by the comparison of MSS., and the use of certain explanatory works called Massoretic treatises, he was enabled to lay a solid foundation for subsequent criticism. The text of the Scriptures themselves had meanwhile been preserved in a state of wonderful purity when all things are considered, and when the revision of the Old Testament appeared in 1885, it was found that the revisers, like the translators of the Authorized Version, had adopted the Massoretic text as the basis of their work, departing from it only in exceptional cases. As a matter of fact, however, it has been recently proved by Dr. Ginsburg, who has devoted twenty-five years of arduous and patient labour to the preparation of a complete edition of the Massorah, that the received text does not accurately represent the original version when it is tested by the rules of the Massorah itself. It is hardly possible in the present state of biblical science to estimate the value of the work accomplished by Dr. Ginsburg, but it will enable the scholars of the future to reconstruct, by means of the Massorah, the actual text of the Old Testament as it existed when the scribes first commenced their critical labours. There are no extant manuscripts of the Old Testament which can be ascribed to an earlier date than the ninth century, and the earliest date known with certainty is 916 A.D., but the Massoretic tradition will enable the scholar to go back at least 1000 years earlier than this, so that the whole critical problem of the future seems likely to be transferred from the text to the Massorah. ("The Massorah, compiled from Manuscripts alphabetically arranged," C. D. Ginsburg, Eng. trans., London, 1884.)

**MASSOWAH**, a seaport on a small island, belonging to Egypt, off the coast of Abyssinia, in the Red Sea. The island is about a mile long and one-fourth broad. It is the residence of a governor and of a British consul. The population numbers about 4000. There is a good trade with Arabia and Bombay—the principal imports consisting of corn, maize, rice, cotton stuffs, silks, muslins, cotton wool, glass, cutlery, arms, hardwares, elephants' teeth, spices, coral, and wines and spirits.

Massowah was in the possession of the Turks in 1850. In 1865 it was transferred to Egypt, and during the troubles in that country in 1883-84 became a subject of negotiation between the British government and Abyssinia. In 1885 it was occupied by an Italian force, with the concurrence of England.

**MAST**, of a ship, is a long rounded upright spar resting on the keelson, and rising through the decks to a considerable height, for the purpose of sustaining the yards upon which the sails are stretched. A ship properly so called has three masts, each having square yards, named, according to position, fore, main, and mizzen masts. A barque has also three masts, but the mizzen is not fitted with square yards; a brig has a fore and main mast and sails like those of a ship, but it has no mizzen mast; a schooner has two masts, but the sails are differently arranged from those of a brig; and a sloop has only one. Wooden masts, which form the great majority, are usually built of several pieces of wood, Norway fir being the best for this purpose, the joints being strongly riveted together and strengthened by iron hoops. For small vessels masts made from a single tree are often used, but they are not regarded as being as strong as a "made mast." The spars rising through the decks are called the lower masts, and above these rise in order the top-masts, topgallant masts, the royal masts, and in clipper ships there is one still higher, the sky-sail mast or sky-scraper. A temporary spar rigged out in a time of disaster is known as a jury-mast. In modern ships the masts are often constructed of hollow iron, and iron is also used in the construction of yards and rigging. Well-made iron masts are at once lighter and stronger than those of wood.



**MASTER AND SERVANT.** The relation of master and servant, generally speaking, is constituted when one person hires the labour of another for a term, and it is constituted entirely by contract. It is always advisable that contracts of hiring and service should be in writing, and if the engagement be for more than one year this is rendered necessary by the provisions of the Statute of Frauds. There is no necessity for the drawing up of a formal deed, however, as a note or letter is recognized as sufficient evidence of an agreement. The terms of a contract of service are, for the most part, such as the parties interested choose to make; but in the absence of express stipulations, the terms may be defined and enforced by law. Where no time is limited, either expressly or by implication, for the duration of a contract of hiring and service, the hiring is considered "a general hiring, and in point of law a hiring for a year." In the case of a hiring for an indefinite time, if the servant continues in the service after the first year, and the wages have been paid without any express contract for hiring, a renewal of the contract is presumed on the same terms. This does not apply in the case of an agreement to do work by the job, even though the job lasts more than a year. In the case of domestic servants there is a rule, founded solely upon custom, but recognized and enforced by law, by which a contract of service may be determined at any time by giving a month's warning, or paying a month's wages, and this although the servant has been hired at so much a year. This rule applies to both sides, and domestic servants have a right by custom to leave their situations at any time on payment of a calendar month's wages in advance. But where a domestic or other yearly servant *wrongfully* quits his master's service, he forfeits all claim to wages for that part of the current year during which he has served. The discharge of a hired servant may be justified at any time during service for incompetence, habitual negligence, conduct calculated to seriously injure his master's business, wilful disobedience to any reasonable and lawful order, gross moral misconduct, dishonesty, drunkenness, and permanent disability from illness. Where a servant, living under his master's roof, falls sick the employer is bound to continue to provide food; but he is not bound by law, whatever may be his duty in this respect, to provide medical attendance.

By the death of a master the servant is discharged, and the executors cannot enforce, nor are they bound to sustain, the contract. A servant is bound to take due and proper care of his master's property intrusted to him, and if guilty of gross negligence, whereby such property is injured, he will be liable to an action at law. For ordinary accidents or losses a servant cannot be made answerable, nor may the value of an article lost or broken be deducted from his wages, unless an express stipulation to this effect is made at the time of hiring. A servant intrusted with money or goods is not answerable if feloniously robbed of them. A master is liable for injury caused by the fault or negligence of his servant, if at the time the injury is done the servant is acting in the execution of his master's orders, and within the scope of his employment as a servant. Thus it is laid down, that if a coachman driving his master's carriage in the execution of his duty as a servant, shall carelessly run down or injure any person, the master will be liable. But if the servant, without the master's knowledge or contrary to his orders, shall drive the carriage, and while driving it cause an injury to other persons, he alone will be liable, and the master will not be held responsible. A master is not liable for a criminal act committed by his servant, as every man must answer for his own crimes. A servant who commits an unlawful act in obedience to his master, knowing it to be unlawful, is personally liable for the consequences, and has no claim of indemnification, inasmuch as no man is bound to obey orders in such a case. Where a servant, acting in obedience to his master's orders, is led

unwittingly into the commission of an unlawful act, he will be entitled to an action against the master for the damages he may suffer. As a general rule a servant takes the risk of all the ordinary accidents liable to the particular service for which he is engaged; but where personal injury is sustained through the negligence or fault of the employer, or of any person whom he has intrusted with the superintendence of the work, or employed to carry out any portion of it, the employer is liable. The law on this subject is regulated by the Employers' Liability Act, which came into operation 1st January, 1881.

There is no law whereby a master or mistress can be compelled to give a servant a character, and inasmuch as, under ordinary circumstances, a refusal to give a character is taken as being equivalent to the giving of a bad one, this represents a hardship which ought to be removed. When a master gives a servant a character, what he says or writes in good faith to a person making the inquiry is a privileged communication, upon which no action can be maintained; but where an employer maliciously states what is not true to the injury of a servant, he renders himself liable to an action for defamation of character. Any person who falsely personates a master or mistress, or who gives a forged or counterfeit character to any person offering himself or herself to be hired into the service of another, is guilty of a misdemeanour, and may be punished with fine or imprisonment. If a master knowingly gives a false character of a servant to a person about to hire such servant, and the servant afterwards robs or injures his new master, the former master will be liable to an action for damages.

If any person entice away a servant before the expiration of the hiring, the master may sue such person for the loss inflicted upon him, and a master may also bring an action against a third party who injures or disables his servant. By this rule also a master may have an action against a man for the seduction of his female servant, and the age of the female seduced is immaterial; so also whether she be a girl, a widow, or married woman. A daughter who performs any domestic service for her parents will, for the purposes of such an action, be regarded as a servant, and indeed it is only by virtue of this law that a parent can recover damages from a man who has seduced his daughter.

In Scotland the law of master and servant is very similar to that of England, the differences being in many respects more apparent than real. The following may be mentioned as the more important points in which the law of Scotland presents peculiarities. In Scotland servants are generally presumed to be hired by the half-year, but this rule is always subject to the custom of the locality; and there are certain classes of servants—such as farm-servants, gardeners, gamekeepers, managers, tutors and governesses, commercial agents, &c.—where the presumption appears to be for a yearly engagement. Wages fall under the triennial prescription. They are not liable to arrestment unless when they exceed £1 per week; and they obtain a preference in competition with ordinary debts. To prevent tacit re-election—that is, renewal of the contract by implication—warning or notice of intention to determine the contract is necessary. As a rule the warning must be given forty days before the term of Whitsunday or Martinmas, but no special form is necessary. If the servant is engaged for a less period than a half-year, the length of warning is regulated by local custom, and in its absence by what seems fairly reasonable. A domestic servant hired by the month is entitled to a month's warning only. When a female servant marries, the Scotch law appears to be that her husband can take her out of her master's service, though he may be liable to compensate her master for the loss of her services. See on this subject Lord Fraser's work on "Master and Servant."

**MASTER OF ARTS.** See ARTS, DEGREES IN.

**MASTER OF THE BUCKHOUNDS**, an officer of the British royal household to whose care is intrusted the management of all matters pertaining to the royal hunts. A salary of £1700 is attached to the office, which is conferred on a supporter of the party in power. Being a political office, it is vacated when there is a change of ministry.

**MASTER OF THE CEREMONIES**, an office instituted at all the royal courts of Europe for the more honourable reception of persons of distinction, and for the direction of matters of state etiquette. It was first established in England in 1603. The term was afterwards extended beyond the court, to persons who were appointed to preside over the amusements at Bath and other fashionable resorts, and it is now given to the director of the arrangements of any public ball.

**MASTER OF THE HORSE**, one of the officers of the British court, who has superintendence of the royal stables and of all the horses belonging to the sovereign. The office is one of great dignity and antiquity, and is usually held by a nobleman. The salary is £2500 a year, and the tenure of office depends on the existence of the political party in power. The master of the horse rides next to the sovereign on all state occasions, and has the privilege of making use of the royal horses, pages, and servants. In his department are eleven gentlemen equerries and four pages of honour.

**MASTER OF THE HORSE** (Lat. *Magister Equitum*), the chief military commander under a dictatorship in the Roman republic. Usually a dictator appointed his own master of the horse, but sometimes the citizens appointed him. The office was of great importance, as a dictatorship superseded all the ordinary laws of the republic for its duration of six months, and the state was under martial law during that time.

**MASTER OF THE HOUSEHOLD**, an officer in the lord steward's department of the British royal household. This office is held during the sovereign's pleasure, and is not dependent on political changes. The salary is £1150 per annum, and the duties are the selection and management of the household servants.

**MASTER OF THE ROLLS**, now one of the chief judges of the Chancery division of the High Court of Judicature, formerly the chief of a portion of the High Court of Chancery. The office was held as far back as 1286,

and became of great importance. It was regulated by Acts of Parliament in 1730, 1825, and 1837. In 1838 the supremacy over the Public Record Office was given to the master of the rolls. The result of this has been the magnificent "Rolls" series of reprints of the ancient chronicles of England. One of these (Jocelyn de Brakelonde) forms the groundwork of Carlyle's "Past and Present."

**MASTIC**, a resin which exudes from vertical cuts made in the trunk and branches of the *Pistacia Lentiscus*. This tree grows in the Levant, and particularly in the island of Scio. Mastic is composed of two resins, one of which is soluble in dilute alcohol, and the other is not; this last constitutes from one-twelfth to one-fifth of the whole weight of the mastic, and possesses very nearly the characters of copal, it being soluble in absolute alcohol, ether, and oil of turpentine; these liquids also dissolve mastic without leaving any residue. Mastic is principally employed as an ingredient in varnish, and as a temporary stopping for carious teeth. See *PISTACIA*.

**MASTIFF** is the name of a variety of dog of a very old English breed, now seldom seen in its original state of purity. A true-bred mastiff is of considerable size and very stoutly built. The head is well developed and large, the muzzle broad, the lips deep and pendulous on each side of the mouth, the ears small and partly drooping, the tail well developed, and the whole aspect noble. The mastiff stands about 30 inches high at the shoulder, and is usually of a buff colour with dark muzzle and ears. His courage and fidelity make him especially valuable as a watch-dog. It has been known in former times to attack lions and leopards with success. British mastiffs (though some think bull-dogs) were highly prized in ancient Rome for their prowess in the combats of the amphitheatre. The English mastiff is somewhat crossed with the stag-hound and the bloodhound. The Tibet dog is a magnificent mastiff kept as a watch-dog by the tribes inhabiting the table-lands of Tibet. It is about the size of a Newfoundland dog, with the fur deep black, and a few tan-coloured spots on the face and limbs. The head is heavier than that of the English mastiff, and the tail is bushy. This dog, though strongly attached to its master, is extremely fierce and strong, and when soured by confinement becomes dangerous to strangers.



Mastodon Restored.

**MASTODON** is the name of an extinct genus of mammals belonging to the order PROBOSCIDEA, and closely allied to the elephant. This genus is confined to deposits of Tertiary age, commencing in the Miocene and reaching to the Pleistocene epoch. In the greater portion

of their organization the mastodons must have closely resembled the elephants. The tusks, the proboscis, the general conformation of the body, and the limbs were very similar; and the principal distinction between the two genera was formed by the molar teeth. These indeed were

gradually pushed forward from behind as they are in the elephant, and displayed the same relative increase in proportion as the animal was advanced in life; but unlike those of the elephant, their crowns exhibited on cutting the gun large conical points of a mammiform structure, whence the animal derives its name. As these conical points were worn down by mastication, the tooth presented discs more or less large according to the degree of attrition which it had undergone. The molar teeth were six in number on each side in each jaw, of which as many as three were sometimes in place at the same time. The tusks or upper incisors were well developed and straight. Unlike the elephant the mastodon had also short tusks in the lower jaw, but these do not seem to have been ever present in some species, and were generally shed early by the female, the male sometimes retaining one or both.

The species of mastodon are tolerably numerous, and have been found in both hemispheres. In Europe and Asia they appear to have become extinct in the Pliocene epoch, whereas in America they survived into the Pleistocene period. *Mastodon arvensis*, remains of which have been found in the crags of Norfolk and Suffolk, belongs to the section of the genus Mastodon distinguished by having four ridges to the molar teeth. One of the best known species is the North American Mastodon (*Mastodon giganteus* or *ohioticus*), which did not become extinct till quite late in Pleistocene times, and whose remains are found in abundance in various parts of the United States, often in boggy places in an excellent state of preservation. The skeleton is 11 feet high, 17 feet long exclusive of the tusks and tail, and the tusks are about 11 feet long. One short tusk-like incisor was retained in the lower jaw of the male. A Mastodon (*Mastodon turicensis*) discovered at Turin by Sismunda in beds of the Upper Miocene period seems to have had no lower incisors, and agrees with *Mastodon ohioticus* in having three ridges to its molar teeth. A species (*Mastodon sivalensis*), from the Sivalik Hills in India, of the Upper Miocene time, had five ridges to its molars. Numerous other species are known of this genus. As far as may be inferred, the mastodon agreed with the elephant in its habits, feeding on vegetable matters.

**MASULIPATAM** (Hindu, *Machli-patnam*, Fish-town) is the chief town of Kistna district, Madras, situated on a small offshoot of the Kistna River, 215 miles north of Madras city, and has a population of 40,000. The Fort contains the barracks and arsenal, which have been suffered to fall into decay since the withdrawal of the garrison in 1865, the Protestant and the Roman Catholic churches. All round stretches an expanse of waste land, swampy in the rainy season, and deep with sand during the remainder of the year. About a mile to the north-west rises a slight hill, on the highest part of which are the houses of the European residents and the modern cantonment. Further away, and on a lower elevation, stands the *pet* or native quarter, which is fairly well laid out with streets and brick houses. Masulipatam is still the principal port of Kistna district, though it has few natural advantages, and suffers in addition from competition with Cocanada, on the Godavari, with which the Kistna delta has inland communication by water. The sea deepens so gradually that large ships cannot anchor nearer than 5 miles from the shore; and during the monsoon, from October to December, all communication is suspended.

Masulipatam, which is said to have been first acquired by the Mussulmans in 1480, was the earliest British settlement on the Coromandel coast. An agency was established here in 1611 by Captain Hippon, who commanded the *Globe* on what is known as the "seventh voyage" of the East India Company. In 1622 the English traders, driven by the Dutch from the Spice Islands, and also from Pulicat, succeeded in founding a factory at Masulipatam. In 1628 they were driven out for four years, but they returned under

a firman from the Mohammedan king of Golconda, which is known as the Golden Firman. The station then became the centre of English trade in those parts, and was managed by a chief and council. About 1660 the Dutch also established a factory, and the French followed in 1669. In 1686 the Dutch quietly took possession of the government of the town, forbidding the English to trade. This state of things did not last long, however, for three years later Zulfikar Khan seized the factory, and in 1690 the full right of trade in Masulipatam was given to the English by firman. From this time until the Wars of the Carnatic there appear to have been no events of importance at Masulipatam. In 1750 it was, with the surrounding country, given to the French by the Nizam; and from 1753 to 1759 the English were excluded. In the latter year Colonel Forde carried the town and fort by storm, and in 1765 the Northern Circars were assigned to the English. It was to promote the export of cotton goods that Europeans first settled on the Coromandel coast. Up to the present day weavers form a large portion of the inhabitants of Masulipatam, though their trade has greatly declined since the beginning of this century. In modern times Masulipatam has acquired a new interest as the centre of missionary labour in the Telugu country, but the importance of the town is on the decline. A heavy blow to it was the storm wave of 1854, which swept over the entire town, and is reported to have destroyed 30,000 lives. As happens not unfrequently, this disaster occurred at night, so that many were drowned in their beds. Even in the European quarter the survivors owed their lives to being warned in time from the Fort, so that they were able to escape to the upper storeys of their houses. A similar calamity is traditionally related to have befallen the place in the days of the Dutch occupation.

**MATAN'ZAS**, a fortified seaport on the north coast of Cuba, next in commercial importance to Havana, from which it is 52 miles distant. It stands on the level of the banks of the San Juan, by the mud of which its harbour is much injured. It is well and durably built of stone, but has few handsome buildings. The harbour, in front of the city, is protected by a ledge of rock, 4 feet below the surface, which serves as a natural breakwater to defend the vessels at anchor within it from the swell. The town has a good trade in sugar and coffee. The population is about 40,000.

**MATAPAN', CAPE**, the ancient *Tenarus*, the southernmost point of the Morea, Greece, being the most southerly point of the continent of Europe, except Cape Tanais, in Spain. It is composed of limestone of the Cretaceous system, and rises boldly from the sea. In it is a remarkable cavern, believed by the ancients to have been one of the entrances to the lower world.

**MATCH**, in gunnery, is a material employed in firing military mines and occasionally in discharging pieces of ordnance. Before the invention of firelocks hand-guns or small-arms were fired by matches, which the soldiers carried with them when on service; and matchlock fire-arms are still used in some remote parts of Asia.

*Slow-match* is only a piece of slightly twisted hemp which has been well soaked in a strong solution of saltpetre with boiling water. It burns very slowly, a piece a yard in length being scarcely consumed in less than eight hours. *Quick-match* consists of a wick of cotton steeped in a mixture of saltpetre and meal powder with spirit of wine and rain-water.

**MATCHES**. These useful articles for obtaining instantaneous fire and light, and which seem such an indispensable adjunct of civilization, are of very recent introduction. Up to the end of the first quarter of the present century almost the only method used in civilized countries was that of striking sparks upon tinder by means of a flint and a piece of steel. A flint, steel, and tinder box formed part of the furniture of every household, and one

of the regular industries of each country was the making of brimstone matches, thin strips of resinous pine wood, about 6 inches long, with pointed ends tipped with sulphur, which readily ignited when applied to a spark moving along the ignited tinder. The latter in the ordinary way consisted of partly-burned pieces of cotton or linen, but touch-paper or blotting-paper impregnated with saltpetre, and amadou or German tinder, a peculiar preparation of several species of fungi belonging to the genus *Polyporus*, were also used for the same purpose. In 1805 a French chemist, M. Chancel, devised an apparatus for producing fire by the action of sulphuric acid upon chlorate of potash and sugar. A splint or match coated with sulphur in the ordinary way was tipped with a mixture of chlorate of potash and sugar, and this was introduced into a small bottle filled with asbestos saturated with strong sulphuric acid. At a later period Prometheans, paper splints coated with the sugar and chlorate composition, and containing a small glass globule filled with sulphuric acid, were introduced. The globule was broken by a tap with a hammer, and the liberated acid at once ignited the paper. The first really practical friction match that was introduced was made in England in 1827 by Mr. John Walker, a druggist, of Stockton-on-Tees. These matches, which were called Congreves, after the name of Sir William Congreve, Bart., the inventor of the Congreve rocket, were flat wooden splints, tipped first with sulphur and afterwards with a mixture of gum, chlorate of potash, and black sulphide of antimony. They were ignited by drawing the match tip vigorously and sharply between a piece of folded sand or emery paper, and the composition was apt to be torn off by the violence of the friction necessary. In 1833 the phosphorus or lucifer match was introduced on a commercial scale, and this rapidly superseded all other forms. The names *congreve* and *lucifer* seem to have been used somewhat indiscriminately after this period, and the latter term is still in common use. At the present day phosphorus still forms the chief igniting ingredient in ordinary matches, but many different methods are practised for rendering it available.

The chief operations in a match factory are the preparation of the splints and the dipping them in the igniting composition, the minor operations being the preparation and filling of the boxes. The wooden splints used are cut by steam machinery from the best quality of pine wood, though poplar and aspen are sometimes used for this purpose; Swedish and English matches being square in section, and Austrian and German usually cylindrical. Several different machines have been devised for cutting the wood into splints, some of which are capable of turning out from 15,000,000 to 17,000,000 per day. In England the splints are of two sizes—large and minnikins; the former being about  $2\frac{1}{4}$  inches long, and the latter somewhat shorter. In the manufacture double lengths are used, so that each splint may be coated with the igniting composition at both ends, and then cut asunder in the middle to form two matches. After cutting, the splints are subjected to an ingenious sifting process, by which they are freed from splinters and fragments, and also arranged in parallel order and in uniform quantities for dipping. For the latter process they are arranged by a machine in frames in such a way that each splint is placed at a small distance from its neighbours, just enough to allow it to become properly coated, and to prevent the whole being clotted into a mass. A single machine, worked by one attendant, will place about 1,250,000 matches in the frames in one day. When properly arranged the ends of the matches, after being heated, are dipped first into molten paraffin wax, which has now generally taken the place of the molten sulphur formerly used, and then into the igniting composition, which is kept spread to a uniform depth of about one-eighth of an inch on a smooth slab or in a shallow pan, kept warm by means of steam beneath. The different

processes are performed very rapidly, and a skilled workman can dip about 8,000,000 matches in the course of a day's work.

The different compositions for tipping the matches in use in different countries and factories all consist essentially of emulsions of phosphorus in a solution of glue or gum, with certain other ingredients designed to increase the combustibility or to impart colouring. The nature of these ingredients, and the proportions in which they are mixed, are kept as trade secrets by most of the match-makers, and they vary also according to the climate for which they are designed. In England, in addition to the phosphorus and glue, chlorate of potash and powdered glass are used to increase the igniting power, and red lead, smalt, Prussian blue, or magenta to impart colour. Where chlorate of potash is used the matches deliquesce with a sharp explosive noise, and such matches require but a small quantity of phosphorus to insure ignition. On the Continent chlorate of potash is regarded as dangerous, and a composition containing a larger amount of phosphorus, with nitre, red lead, or binoxide of manganese, is employed instead—these matches, which inflame without fulmination, being known as noiseless or silent matches. The amount of phosphorus used in the different compositions varies greatly, some recipes giving a proportion as high as one-seventh of the whole, and others as little as one-tenth or one-twelfth. It has been estimated that about 1200 tons of phosphorus are used annually in the match trade of Europe—Oldburg, near Birmingham, and Lyons being the chief centres of its manufacture. After the manufacture of phosphorus matches had become an established industry, it was found that the fumes to which the workpeople were exposed were very detrimental to their health, and a very painful and distressing disease was developed, which in the end produced necrosis of the jaw-bone. By scrupulous attention to ventilation and cleanliness the evil effects arising from phosphoric vapours may be very greatly mitigated; but these are conditions which it is not always easy to secure, either from employers or workpeople. It was also found that ready ignition had its disadvantages as well as its uses, and many dangerous and fatal fires have been traced to the accidental ignition of matches. Happily both dangers have been very greatly mitigated, if not entirely overcome, by the discovery of amorphous phosphorus made by Professor Anton Von Schrötter of Vienna in 1845, and its utilization by Lundsbröm of Sweden in 1855 for the manufacture of the well-known safety match. The red or amorphous phosphorus suffers no change by exposure to the air like the ordinary form of this element, it is incapable of ignition by friction, it possesses no taste or odour, is insoluble in all liquids which dissolve ordinary phosphorus, and it requires a very high temperature before it will ignite. In the successful application of this material the ends of the matches are tipped with a composition chiefly composed of chlorate of potash, red lead, and sulphide of antimony mixed in glue, while a striking paper was made by combining with the sand amorphous phosphorus and sulphide of antimony. They were first manufactured in England by Messrs. Bryant and May, and they are every year coming into more general use. More recently other modes of using amorphous phosphorus have been introduced upon the Continent, and for one of these it is claimed that by its means non-poisonous matches may be made of better quality and at a cheaper rate than those made in the ordinary way.

Next in importance to the making of wooden matches is that in which short pieces of wax taper are used instead of splints. These are commonly known as *vestas* or wax matches, and the taper is made by dipping from twenty to thirty fine cotton threads in a mixture of molten tallow and paraffin. They are then smoothed and rounded by being drawn through perforated iron plates.

Vesuvians are matches made to ignite in the wind, for the use of smokers, and have large oval heads composed of charcoal, saltpetre, glass, gum, and some sweet-smelling bark, tipped at the end with the ordinary igniting composition. The splints are sometimes of wood, but more often of other and non-inflammable material, as it is the head, not the splint, which is the useful part. An older form of smokers' match was the *fusée*, made in sheets, of a material akin to slow-match cut into small strips not quite severed from the sheet, and tipped with inflammable composition. One of these strips was torn off when needed and ignited by friction, when it burnt with a bright glow. As the end could not be readily extinguished after use and was thrown away still alight, and as the form of the matches led to their being carried loose in the pocket, many accidents occurred, and on the introduction of vesuvians fuseses at once disappeared.

It is not easy to obtain very accurate statistics of the extent of the match trade of the United Kingdom, but it is believed to amount to about £1,500,000 a year, and this would represent a turnout of 300,000,000 daily. In France match-making is a government monopoly, which is farmed out to a powerful company of makers, and matches in consequence are very bad and very dear. In the United States the industry is protected by a heavy duty on all imports, and matches are taxed at the rate of a cent per 100.

**MATÉ** or **PARAGUAY TEA** is prepared from the leaves of several species of *Ilex*, small trees which are nearly allied to the holly, and are somewhat like it in appearance. *Ilex Paraguayensis* and the other species are natives of the valleys which descend from the mountains in Paraguay and the southern part of Brazil. Before the discovery of America the natives collected the leaves from the trees, which abounded in the woods. When the Jesuits administered the country they started plantations and improved the quality by cultivation. The leaves are gathered once in three years, dried over a fire, and then reduced to powder. The mode of preparation is to put some of the powdered leaves into a calabash, and pour boiling water upon it. The shrub is called yerba, and the calabash a *maté*—a name which has been transferred to the prepared drink. The *maté* must be drunk almost directly after it has been made, otherwise it turns black and bitter. A tube, called a bombilla, is inserted into the calabash, with a wire cage at the end, which prevents the dust from entering the tube. Every one has his tube, and the *maté* is passed round for each to suck his share. Like tea, *maté* is very refreshing, and it prevents exhaustion on long journeys. The Plate **MATÉ** represents a flowering branch of the shrub, with a flower and portion of a leaf enlarged. Figures, reduced two-fifths of the natural size, are also given of a bombilla, and a curved and silver-mounted *maté*.

**MATERIA MEDICA**, the division of medical science which treats of the knowledge of medicines, their action on the animal economy, and mode of administration. Much labour has been spent in contriving classifications of the *materia medica*. Some have arranged the articles according to their natural resemblances; others according to their real or presumed virtues; others according to their active constituent principles. Of old the *materia medica* consisted of more articles than at present. The tendency is to diminish it still further, and to get rid of those articles which possess no advantages over others equally common, or whose properties are doubtful.

**MATERIALS, STRENGTH OF**, is the power that a solid body possesses of resisting forces tending to break it. The load, or combination of external forces, which is applied to any piece in a structure or in a machine, produces strain, or alteration of the volume and figure of the whole piece, and of each of its particles. The strained particles exert stress, being an effort to recover their original volumes and figures; and the strain adjusts itself so that the com-

bined stress of the particles balances the action of the load. If the load is continually increased it at length produces either fracture or (if the material is very tough and ductile) such a disfigurement of the piece as is practically equivalent to fracture, by rendering the piece useless.

The ultimate strength of a body is the load required to produce fracture in some specified way. The proof strength is the load required to produce the greatest strain of a specific kind consistent with safety; that is, with the retention of the strength of the material unimpaired. A load exceeding the proof strength of the body, although it may not produce instant fracture, produces fracture eventually by long-continued application and frequent repetition.

Each solid has as many different kinds of strength as there are different ways in which it can be strained or broken, as shown in the following classification:—

	Strain.	Fracture.
Direct.	(Extension ...	Tearing.
	(Compression ...	Crushing.
	(Distortion ...	Shearing.
Transverse	(Twisting ...	Wrenching.
	(Bending ...	Breaking across.

A factor of safety is the ratio in which the ultimate strength or breaking load of a body is greater than the working load. For a dead load (that is, a load applied by slow degrees, and acting with perfect steadiness, like the weight of the structure itself) the factor of safety in the case of perfectly sound materials may be made simply equal to the ratio in which the ultimate strength is greater than the proof strength. For a live load (that is, a load put on suddenly and accompanied with vibration and rapid motion, like a swift train on a railway bridge) the factor of safety is in general made twice as great, because the straining effect of a load suddenly applied is about twice as great as that of the same load when applied by slow degrees. In practice the load is usually partly dead and partly live; or its action is intermediate between that of an absolutely steady load and an absolutely sudden load; and accordingly, the factor of safety has intermediate values. A further allowance is in general made in the factor of safety to provide against unforeseen defects in the material or workmanship. The following are examples:—

	Dead Load.	Live Load.
Factors for best possible materials and work, . . . . .	2	4
Factors for good ordinary materials and work—		
In iron and other metals, . . . . .	3	6
In stone and brick, . . . . .	4	8
In timber, . . . . .	5	10

Most experiments on the strength of materials give the ultimate strength only. In using those data for the designing of structures and machines, the most convenient process of calculation is to multiply the intended working load of a piece by the proper factor, so as to find the breaking load, and to make the ultimate strength of the piece equal to that breaking load.

The proof or testing by experiment of the strength of a piece of material is to be conducted in two different ways, according to the object in view.

I. If the piece is to be afterwards used, the testing load must be so limited that there shall be no possibility of its impairing the strength of the piece; that is, it must not exceed the proof strength. About double of the working load is in general sufficient.

II. If the piece is to be sacrificed for the sake of ascertaining the ultimate strength of the material, the load is to be increased by degrees until the piece breaks, care being taken, especially when the breaking point is approached, to increase the load by small quantities at a time, so as to get a sufficiently precise result.

The proof strength requires much more time and trouble for its determination than the ultimate strength. One mode of approximating to the proof strength of a piece is to apply a moderate load and remove it, apply the same load again and remove it, two or three times in succession, observing at each time of application of the load the strain or alteration of figure of the piece when loaded, by stretching, compression, bending, distortion, or twisting, as the case may be. If that alteration does not sensibly increase by repeated applications of the same load, the load is within the limit of proof strength. The effects of a greater and a greater load being successively tested in the same way, a load will at length be reached whose successive applications produce increasing disfigurements of the piece; and this load will be greater than the proof strength, which will lie between the last load and the last load but one in the series of experiments.

It was formerly supposed that the production of a set—that is, a disfigurement which continues after the removal of the load—was a test of the proof strength being exceeded; but it is now known that in most materials a set is produced by almost any load, however small. See also on these points the article FLEXURE.

*Tenacity.*—The ultimate strength or breaking load of a bar exposed to direct and uniform tension is the product of the area of cross section of the bar into the *tenacity* of the material.

The following are some of the most useful values of the tenacity of materials, in lbs. on the square inch:—

## METALS.

Bronze or gun metal (copper 8, tin 1), . . .	86,000
Copper, cast, . . . . .	19,000
“ sheet, . . . . .	80,000
“ wire, . . . . .	60,000
Iron, cast, various qualities, . . . . .	13,400 to 29,000
“ malleable: boiler plates, . . . . .	50,000
“ “ large forgings, . . . . .	40,000 to 50,000
“ “ wire, . . . . .	70,000 to 100,000
Steel, . . . . .	80,000 to 130,000

## TIMBER.

Ash, . . . . .	17,000
Fir and pine, . . . . .	12,000 to 14,000
Oak, . . . . .	10,000 to 19,800
Teak, Indian, . . . . .	15,000

## MISCELLANEOUS.

Hempen hawser, <i>girth in inches squared</i> , . . .	1,050
Hempen cable, <i>girth in inches squared</i> , . . .	672
Iron wire ropes, <i>per square inch of iron</i> , . . .	90,000
“ “ <i>per pound weight to the fathom</i> , . . .	4,480
Leathern belts, <i>working tension per square inch</i> , . . .	285
Silk fibre, <i>tenacity per square inch section</i> , . . .	52,200

*Resistance to Direct Crushing.*—Direct crushing is produced by pressure in those cases in which the pillars, blocks, struts, or rods, along which the pressure acts, are not so long in proportion to their diameter as to have a sensible tendency to give way by bending sideways.

## MATERIALS.

Crushing pressure,  
in lbs. on the square inch.

Brick, . . . . .	550 to 1,100
Granite, . . . . .	5,500 to 11,000
Limestone, . . . . .	4,000 to 4,500
Sandstone, . . . . .	2,200 to 5,500
Cast iron, . . . . .	82,000 to 145,000
Asi (dry, along the grain), . . . . .	9,000
Oak, elm, “ . . . . .	10,000
Fir, pine, “ . . . . .	5,400 to 6,200
Teak, Indian, “ . . . . .	12,000

The resistance of timber to crushing while green, is about one-half of its resistance after having been dried.

As a rule wrought-iron beams and timber beams tend to give way by crushing, but cast-iron beams when they give way always do so by tearing. Box's treatise on the subject (London, 1883) is an excellent and practical work, happily combining philosophical theory, scientific induction, and practical illustrations drawn from present circumstances.

**MATERIALISM.** In tracing the history of philosophy we find that at a very remote period there arose in the minds of thoughtful men who were seeking to penetrate the mystery of being, the conception of two distinct modes of existence, one material and the other immaterial or spiritual. Perceiving the difference between a thought and a thing, they regarded the mind or soul as being distinct from matter, and as being an immaterial, supersensible, or spiritual power in contrast to material or sensible objects. By most thinkers mind was exalted at the expense of matter, and we find in many of the early systems of theology and philosophy that the latter was regarded as being evil in its nature, a power which offered resistance to the beneficent action of the gods, and which restrained, impeded, and even defiled the pure spirit within man. The leading motive in many religious systems was the desire to set free the mind of man from the thrall of matter, and from this source springs the asceticism which may be found in connection with all religions.

Certain idealistic theories, in which all matter, or rather all perception of matter, is regarded as an attribute of mind, early attracted some thinkers, while others preferred those views in which matter is exalted until mind becomes merely one of its properties. To the latter system the name materialist has been given. Foremost among the advocates of materialistic theories in the western world we find the atomism of the Greek philosophers Democritus and Epicurus, and the Latin poet Lucretius. The magnificent poem of the last, “*De Rerum Natura*,” appears to be the outcome of the strongest aversion from the current theology of the time. Lucretius accepted the teaching of Epicurus as being the best method available for delivering men from the slavish fear of the gods and the cowardly fear of death. He did not deny the existence of the gods, for, like most materialists, he was a reverent man in his own fashion, but he urged that, as all men then believed the world had come into existence of itself and not as a creation of the gods, so also it continued in existence without their constant interposition (special providence); and further, that the soul of man is as closely linked to his body as are his senses, and perishes, therefore, with the death of the body. Hence Lucretius felt able to urge that there was no reason why men should fear either the present wrath of the gods (who, it was easy for him to show, did not, as a matter of fact, interfere in this world, disturbing the order of nature, in the manner alleged by their priests), or any future punishment of theirs after death. His arguments are not advanced in the interests of self-indulgence, for he indicates the independent existence of punishment, but as a means of freeing man from the influence of debasing superstition. Again, at the close of the eighteenth century materialism came into fashion on account of its opposition to a narrow and unspiritual theology. For reasons not unlike those of the poet Lucretius, the French encyclopædists of the last century were anxious to disprove the constant interposition of Divine Providence, and to cast doubt on the life after death. The doctrine, that we know nothing in the universe save matter and blind or unconscious force, is even now occasionally advocated by some of the scientific teachers of the Continent. Smarting under the evils caused by defective civil and religious systems, men express their sense of wrong and revolt in various ways, and at the present day a favourite method is found in the advocacy of the most extreme forms of materialism.

In conclusion, we may observe that thorough-going materialism as a system of thought is generally rejected by

the leading thinkers and scientific observers of to-day. Professor Huxley, in his "Physical Basis of Life," asserts that "the materialistic position, that there is nothing in the world but matter, force, and necessity, is as utterly devoid of justification as the most baseless of theological dogmas," and more recently Mr. Herbert Spencer has declared that "the conception to which an explorer of nature tends is much less that of a universe of dead matter than that of a universe everywhere alive."

**MATHEMATICS** (Gr. *mathêsis* or *mathêma*), a name given in the first instance to a branch of knowledge, not as descriptive of its subject-matter, but of the methods and consequences of learning it. The word *mathêsis*, and the Latin *disciplina*, by which it has been rendered, have been the origin of the vernacular terms *mathematics* and *discipline*, the meanings of which have long since separated. The properties of space and number, subject-matters of the *mathêsis*, have usurped the name; so that anything which relates to them, however learned, is called mathematics: the Latin word, on the contrary, still retains the signification of a corrective process; and in speaking of any branch of knowledge is applied when power of mind is derived from the methods of learning it, as well as knowledge from the results.

In the time of Plato the restriction of the term "discipline" to that one exercise of mind which consists in making deductions by pure reasoning from the self-evident properties of space and number was easily justifiable. At present we have, besides mathematics, physics, the study of antiquity, grammar, &c., which have all been made disciplines, but no one of which was then entitled to that appellation. Nevertheless, it has happened that writers, misled partly by the name of mathematics and partly by the pre-eminence of mathematical reasoning in strictness and connection, have spoken as if it were the only cultivator of the pure reasoning power.

Much discussion has arisen upon the psychological question, whether those primary propositions or axioms which, from our clear apprehension and willing admission of them, are called self-evident, are notions inherent in the mind, or deductions of early experience. But mathematics ought not to concern itself about this; the certainty of these propositions is all that it wants, and this is conceded by both sides. The consideration, however, of the fundamental supports of mathematical reasoning is useful and interesting, and, as a safeguard, even necessary in itself, though not at all necessary for mathematical purposes. It is not long since a school of metaphysicians existed, who imagined that because all mathematical definitions are precise, therefore the exact sciences are founded upon definition. It was not to them a necessary result of the constitution of our faculties that the three angles of every triangle make up the same amount, but as a consequence of definition, which might have been something else, upon different suppositions. But in the common experience of mankind all axioms, as they are called, have the highest sort of certainty, namely, that they cannot be imagined otherwise.

Whatever may be the metaphysical hypothesis to which it is referred, it is certain that there is a real distinction between a mathematical assertion and one of any other kind. If we say that an unsupported bit of lead will fall to the ground, we state a fact of which we are as certain, in the sense of reliance, as we are of the other proposition, that two straight lines cannot inclose a space. But in the former proposition, an exception, or even a permanent alteration of the law, is conceivable by the imagination; in the latter the mind would feel sensible of absurdity if it attempted to construct the idea of an inclosure bounded by only two straight lines. No distinctive phrases can be too strong to express the essential difference of these two assertions; but it is a misfortune that all terms which

create a sufficient distinction are linked to one or another theory of the human mind.

Mathematical sciences may be considered either as disciplines of the mind, or as instruments in the investigation of nature and the advancement of the arts. In the former point of view their object is to strengthen the power of logical deduction by frequent examples; to give a view of the difference between reasoning on probable premises and on certain ones, by the construction of a body of results which in no case involve any of the uncertainty arising from the previous introduction of that which may be false; to form the habit of applying the attention closely to difficulties which can only be conquered by thought, and over which the victory is certain if the right means be used; to establish confidence in abstract reasoning by the exhibition of processes whose results may be verified in many different ways; to help in enabling the student to acquire correct notions and habits of generalization; to give caution in receiving that which at first sight appears good reasoning; to instil a correct estimate of the powers of the mind, by pointing out the enormous extent of the consequences which may be developed out of a few of its most inherent notions, and its utter incapacity to imagine, much less to attain, the boundary of knowledge; to methodize the invention of the means of expressing thought, and to make apparent the advantages of system and analogy in the formation of language and symbols; to sharpen the power of investigation, and the faculty of suggesting new combinations of the resources of thought; to enable the historical student to look at men of different races, opinions, and habits, in those parts of their minds where it might be supposed *à priori* that all would most nearly agree; and to give the luxury of pursuing a study in which self-interest cannot lay down premises nor deduce conclusions.

As instruments in the investigation of nature and the advancement of the arts, it is the object of the mathematical sciences to give correct habits of judgment and ready means of expression in matters involving degree and magnitude of all kinds; to teach the method of combining phenomena, and ascending from the complicated forms of manifestation to the simple law which regulates them; to trace the necessary consequences of any law, assumed on suspicion, in order to compare those consequences with phenomena; to construct hypothetical representations of laws, or approximations to laws, which shall sufficiently represent phenomena; to convert processes of known accuracy but complicated operation, into others which make up in simplicity for a certain amount of inaccuracy, and to devise means for judging of that amount of inaccuracy, and confining it within given limits; to ascertain the most probable result of observations or experiments which are discordant with each other, either from errors of measurement or unknown causes of disturbance; to point out the species of experiments which should be made to obtain a particular sort of information, or to decide between two laws which existing phenomena both indicate as of nearly equal credibility; to make all those investigations which are necessary for the calculation of results to be used in practice, as in nautical astronomy, application of force and machinery, and conduct of money transactions; in a word, though that word by itself would not have presented a sufficiently precise idea, to find out truth in every matter in which nature is to be investigated, or her powers and those of the mind to be applied to the physical progress of the human race, or their advancement in the knowledge of the material creation.

The main branches of mathematical science were formerly stated to be arithmetic and geometry, springing out of the simple notions of number and space. This is too limited a description. Unquestionably the science of numbers, strictly and demonstratively treated, and that of geometry, or the deduction of the elementary properties

of figure from definitions which are entirely exclusive of numerical considerations, must be considered as the elementary foundations, but not as the ultimate divisions, of mathematics. To them we must add the science of operation, or algebra in its widest sense—the method of deducing from symbols which imply operations on magnitude, and which are to be used in a given manner, the consequences of the fundamental definitions. The leading idea of this science is operation or process, just as number is that of arithmetic, and space and figure of geometry: it is of a more abstract and refined character than the latter two, only because it does not immediately address itself to notions which are formed in the common routine of life.

The necessity of a demonstrative system of arithmetic (or algebra) is practically denied, in this country at least, by the use of a set of dogmatical rules. Such training would be less prejudicial if the notions of the student on reasoning had, by logical training, become settled, so that he could receive these rules with some fitting idea of their purpose, and of the extent to which they are to be considered as knowledge. As it is, he has no other view of arithmetic presented to him, and his conceptions of number are allowed to be first fettered, and afterwards led astray, by ideas derived sometimes from the reception of the conventional for the necessary, sometimes from modifications of truth which are convenient in practice though unsound in theory. The higher mathematics demand such a very special training, that their processes remain entirely unknown to the great bulk of the people. In fact it is almost as if the mathematicians were a secret body, ordinary men not knowing either what they do, or why or how they do it.

The late Professor W. K. Clifford had a strong desire to bridge over this gulf between mathematicians and non-mathematicians, and more than anyone that ever tried, had the power to overcome the undoubted difficulties of such an undertaking. In several of the essays in his (posthumous) book called the "Common-sense of the Exact Sciences" (1885), one of the International Science Series, does he give the general reader an insight to mathematics. In one, for example, he translates even "Taylor's Theorem" into ordinary English. And that he hoped to succeed in a systematic attempt in this direction is clear from the fact that the title of the volume was originally meant to be "The First Principles of the Mathematical Sciences explained to the Non-Mathematical." This very valuable work, left incomplete by Clifford's too early death in 1879, was completed through the labours of Professors R. C. Rowe and Karl Pearson.

In practical use it is found advisable to divide mathematics into two great provinces, *pure mathematics* and *applied mathematics*; the first dealing with numbers and symbols alone, the latter with their application to actual objects and measurements. Arithmetic and geometry were the first branches of the pure science studied. The Greeks carried geometry to a very high pitch, but their arithmetical methods were too imperfect to allow them to develop the science of number in an equal degree with that of form. Eventually the adoption of the "Arabic" numeration so called, and the invention of algebra, gave a vast impulse to the consideration of number. Within the last two centuries algebra and its derivations have advanced to great perfection. Algebra made trigonometry and conic sections possible; and analytical geometry, and the integral and differential calculus followed quickly after one another. These processes are described under their various headings.

**MATHEW, REV. THEOBALD**, commonly known as *Father Mathew*, the great apostle of temperance, was born at Thomastown, in Tipperary, on the 10th of October, 1790. He was educated at Maynooth, was ordained a priest of the religious order of Capuchins in 1814, and commenced his labours at Cork. Here he became the counsellor, physician, banker, and friend of the poor, and

won their universal love and respect. He introduced the religious brotherhood of St. Vincent de Paul, founded large schools, and established a cemetery on the model of that of Père la Chaise. But the great work of Father Mathew's life is the marvellous reformation which he effected in the habits of his countrymen, by converting large numbers of them from drunkenness to sobriety, giving them a medal to wear, and binding them under a written pledge to total abstinence from spirituous liquors. His first temperance society was founded in Cork in 1838. The number of his adherents was innumerable. Father Mathew's fortune and resources were always exhausted by his philanthropic labours, munificent charities, and the enormous expenses connected with his great mission; and in his declining years he was largely involved in pecuniary difficulties. A pension of £300 was granted to him from the civil list, and collections were made on his behalf in various parts of the kingdom. He died on the 8th of December, 1856.

**MATHEWS, CHARLES**, was born 28th June, 1776. His father intended him for a bookseller, but the son felt an irresistible inclination for the stage, and after several successful provincial appearances, appeared at the Haymarket Theatre, London, in 1803. He subsequently became celebrated in those original entertainments called "At Homes," which he gave both in England and America with extraordinary success. He died 28th June, 1835, at Devonport. He ranked high as a comedian and a mimic. His son, also named Charles Mathews, was a highly distinguished actor in light comedy, and author of some excellently brisk acting plays, of which the best is the "Game of Speculation." His first wife was the famous actress and dancer Madame Vestris. He died in 1878, aged seventy-five, acting almost up to the last.

**MA'TICA or MA'TICO**. This name is applied to an astringent plant brought from Peru, where it has long enjoyed a high reputation for its styptic properties. It is prepared from the leaves of *Piper angustifolium*. Cold water extracts, in about four hours, all its medicinal virtues, and is an eligible means of administering it. A tincture is also employed, and the powdered leaves are given both internally and applied externally. It does not owe its astringent properties to tannin, and it seems to exert a vital action on bleeding vessels, so as speedily to arrest the hæmorrhage. It has been used to check other discharges, such as the profuse expectoration and also the night sweats of consumptive patients. Few drugs exert more than a temporary influence over these symptoms, but among such *matico* seems well entitled to attention.

**MATILDA, COUNTESS** (or "the great Countess"), famous to all readers of Dante (which directly or indirectly means all readers of poetry) from the high office she fulfils in that poem, derives her renown from the gift of all her wealth and estates to the see of Rome in 1077; and though at her death in 1115 the Emperor Henry V. succeeded in recovering part of her vast domains, the bulk was retained by the Pope. From this cause the Countess Matilda stands high in the good memory of the church.

Matilda was daughter of Boniface, count of Tuscany, and was born in 1046. She was married to Godfrey the Hunchback, duke of Lorraine, but the union was probably only a formal one, and in 1076 Godfrey died, just as Matilda succeeded her mother in the sovereignty. She at once flung herself into the cause of the Pope (Gregory VII.), whom she received at Canossa, and to whom she made her famous donation. In the never-ending contests between Gregory and the Emperor Henry IV., Rome could always rely upon her troops. She occupied the Castle of St. Angelo at Rome in 1086 to protect the Holy City itself. In 1089 she married one of the chief Papal partisans, Welf of Bavaria, whose family name (as GUELPH) was in the next century to serve as the papal Shibboleth, but obtained a divorce from him in 1095. In 1111 she made



her peace with the Emperor Henry V., who had succeeded his father. She died while preparing to suppress a revolt in Mantua (1115).

**MAT'INS** (Lat. *matutinae*; Italian, *matina*; French, *matin*, morning), strictly the first part in the daily service of the Roman Church. Matins, however, were divided into two parts, which were originally distinct offices and hours, namely, the *nocturns* and *lauds*. The *nocturns* or vigils were derived from the earliest period of Christianity. They originated in the endeavours of the early Christians to avoid persecution, by performing their "holy mysteries" at night. The custom was afterwards retained from devotion and choice. The *matin lauds* followed next after the *nocturns*, and were supposed to begin with daybreak. We find allusions in the writings of Cyprian, and all the subsequent fathers, to the dawn as an hour of prayer. About the end of the third or beginning of the fourth century there was public worship in the morning, as we learn from the "Apostolical Constitutions," which record the order of the service. At present in the Roman use both *nocturns* and *lauds* are sung on the previous afternoon "by anticipation." Matins or morning prayers in the Church of England Prayer-book are derived about equally from the Roman offices of *nocturns* and *lauds*.

**MAT'LOCK**, a town of England, in the county of Derby, situated in a beautiful dale on the east bank of the river Derwent, 18 miles north by west from Derby, and 143 miles from London by the Midland Railway. The town has manufactures of paper, cotton, and some corn mills, and is chiefly inhabited by the persons employed in the factories and in the neighbouring lead mines. In modern times it has been very much improved, and hotels, houses, and shops have been erected in several directions. There is a bridge over the Derwent. The church is in the later English style of architecture, and has been partially restored. There are also Congregational and other chapels. Matlock Bath is nearly a mile and a half distant from the town, and is much resorted to by visitors, as much for the beauty of the situation as for health. It contains a large number of hydropathic establishments.

The scenery of Matlock-dale is peculiarly picturesque and romantic, diversified with rugged beetling crags, contrasting strongly with the fine verdure of the valley, the most prominent objects being the High Tor and Masson Tull. The former rises almost perpendicularly about 300 feet, the upper half of which is a broad mass of naked brown rock, from which fragments often fall into the river, which flows immediately below, obstructing the channel, and greatly increasing the impetuosity of the stream after heavy rains. Opposite the High Tor, but of a less bold though loftier character, is Masson Hill, on the summit of which are the Heights of Abraham, rising about 750 feet above the river. The population of Matlock in 1881 was 4395, and of Matlock Bath 1698.

**MATRICULA'TION** (Lat. *matricula*) is a register kept of the admission of persons into any body or society of which a record is preserved. Among ecclesiastical writers mention is made of two kinds of *matriculae*, the one containing a list of the ecclesiastics, called *matricula clericorum*; the other of the poor provided for at the expense of the church, called *matricula pauperum*. In modern times the term matriculation is chiefly applied to the enrolment of students at the different universities.

At Oxford every student admitted is entered on the books of some college or hall, or, if "unattached," selects one of the licensed lodgings, where he commences residence immediately on matriculation at the university. The fees are as follows:—A servitor or Bible clerk, 10s.; a peer, or the eldest son of a peer, unless he renounces his privilege of a shorter term of residence, £8; every other privileged person, unless he renounces his privilege, £5; every other person, £2 10s.

At Cambridge admission to a college is either by a personal examination before the tutors and officers, or through a recommendatory certificate specifying the age, qualifications, &c., of the candidate, signed by a master of arts of either university, and accompanied by a deposit of caution-money to the extent of from £10 to £50. The matriculation fees for the common chest of the university are as follows:—Nobleman, £15 10s.; pensioner, £5; fellow-commoner, £10 10s.; sizar, 15s.

At London University every student who proposes to graduate must pass a somewhat rigid and unusually extensive examination before matriculation. This examination takes place twice a year—on the second Monday in January and first Monday in July. The fee for matriculation is £2.

At the Scottish universities matriculation consists in signing a promise of good behaviour and obedience to the rules. There is a uniform fee of £1 paid at matriculation each year.

**MAT'SYS, QUINTEN** (1466–1531), of Antwerp, was undoubtedly the greatest painter in Flanders in his day. His works are even now remarkable for beauty of form, delicacy of finish, solemnity of feeling, and transparency of colouring; and easily flowing drapery and dignity of attitude characterize his chief figures, though the minor personages in his groups are often not only coarse, but vulgar. The "Two Misers" at Windsor is the best Matsys in England, "Christ and the Virgin" at the National Gallery is also a fine work of his; but the splendid "Misers" in that collection, long attributed to Matsys (though so unlike his style in everything but its excellence of painting), is now proved not to be by him, but by Marinus de Seeuw, a contemporary painter. Sir Joshua Reynolds said of Matsys that some of his heads were as fine as Raffaele's.

Quinten Matsys also worked beautifully in iron; there is a very famous well-cover of his near the cathedral at Antwerp. The story goes that he was indeed originally a blacksmith, and rose from the forge through the love he felt for the daughter of a painter, who encouraged him to develop the great genius he had already begun to show.

**MATTER** is the name for all objects external to the mind, the question being reserved, whether the mind is or is not composed of the same elements. What matter is we have no means of knowing. It is sufficient to know and say that man, subject to certain affections of his senses, is led to assign those affections to an external cause. When, therefore, we speak of the qualities of matter, we do not affect to say what that is which is the *substratum* of those qualities, nor even that there is any *substratum* at all. The ordinary unphilosophical use of the word matter mingles the supposed *substratum* with its qualities, but the philosopher is bound sharply to distinguish between the two. For it is perfectly clear that when we see any material object, say an apple, our perception is not the apple nor any part of it, but only certain mental effects peculiar to ourselves. Every perception is an act of mind, and the question immediately arises, Is there anything beyond this? In the articles **BUCKLEY** and **IDEALISM** will be found a fairly accurate statement of those considerations which have made some philosophers answer *No* to the question just put.

We feel certain, directly we attack the problem in earnest, that we can only think of matter as perceived. A tree which no one ever saw or could see would be fairly described as non-existent. It is not an answer to say that in this fashion a tree on a South Sea coral island would be non-existent; for animals there perceive it, and any man sailing in those waters could perceive it also. The tree *must* be thought of as perceivable. In what, then, do the class of perceptions by which we distinguish the external world, or matter, differ from those by which we

distinguish the internal world, or mind? How do we distinguish the tree itself from its image in a looking-glass, or in a mirage, dream, or other illusion, seeing that all we know of the tree is a certain group of qualities which may or may not all of them be the same for other men, and are most probably not all of them the same for other animals than ourselves?

We separate the special qualities of matter wherein we find it to differ from mind into two kinds, primary and secondary. The *primary* qualities are those of Resistance (in which we include weight) and Extension. No purely mental conception—say an emotion of sympathy—can philosophically be said to have weight or breadth; if such terms are used of it they are so used only as figures of speech. Further, these primary qualities are the same for all men and all animals. Every material object occupies a certain amount of space, and offers resistance to the touch, whatever be the percipient mind. The *secondary* qualities are those of Taste, Smell, Feeling (as to smoothness, softness, warmth, &c.), Sound, and Colour, and these are very largely mental. If we encounter a group of secondary qualities we are in doubt until we have assured ourselves of the existence of the primaries whether it is a vision or a material object before us. Further, these secondary qualities differ for each individual, and in all probability for various animals. It is hard to think that the sense of smell in dogs, for instance, does not give more complex and accurate perceptions than that in ourselves. We cannot help feeling that we are to the dog in this respect much as a colour-blind man is to a painter; he may distinguish some of the colours, but red and green (in the commonest case of the affliction) are alike to him. In fact, all this class of perceptions depend for their accuracy and distinctiveness upon the keenness of the percipient mind in the particular quality in question. The limitation just given is abundantly necessary, since some men hear accurately (within the narrow limits to which the human ear is sensible of sound), and at the same time have a very blunted vision, for instance; and so with other perceptions.

We further observe that matter differs from mind in definite exertions always producing definite results. If we run our eyes along the lines of a book the words occur in the same order, and appear always the same. But it is not all so with a purely mental state, an *idea* properly so called; for if we close our eyes and sit perfectly still we can yet fancy we read. We can also re-arrange the words as we please, can imagine them in larger size or in different type, &c., and in fact we are freed from any necessity of movement or any definite order of conceptions.

Thirdly, we may observe that perceptions of material objects always occur in groups. Matter usually affects many senses at once, and often suggests more perceptions than are really present—a fact at the root of many illusions (see on this point the article *ILLUSIONS*). Now the pure states of mind are single; wherever they are grouped it will be found that they are connected with some material perception, or with the memory of such.

Finally, within broad limits, matter affects all men alike as to its specially material qualities, whereas on the mental side each one is differently affected. We have just seen how great are the diversities, even in the mental perception, of the secondary qualities of matter, but what is here meant is something further. Let several persons who hear clearly listen to a symphony of Beethoven. All will have the perception of sound alike; but what that sound means to them will vary, from the man who hearing it becomes utterly weary after five minutes, to him who, wrapt in unutterable ecstasy, has lost all count of time or earthly things. Here we are dealing with a purely subjective experience. Yet all these men would have, within limits due to each one's keenness of perception, identical perceptions of the shape of the instruments and the number and aspect of the per-

formers. The states of matter may be common to many persons, the states of mind are special to every individual.

In our ordinary talk, therefore, we not only set apart material objects as a class, but we quite unwarrantably abstract their *materiality* from all our groups of perceptions caused by them, and assert an absolute existence for this abstraction. There are those who admit freely that there is no redness apart from red things, and that redness is merely a convenient abstraction of the quality red from many objects alike in that particular, and who yet as stoutly assert that beyond and beneath a certain weight, size, taste, smell, feel, and colour, which all men perceive, there exists an unknown object, an apple, whereof these are only the signs by which to know it, but are by no means the apple itself. Apart from the mass of inaccurate reasonings called "common sense," such a contention cannot hold water. Every unbiassed mind will have to admit upon consideration that there is nothing in his mind but mental perceptions, and that these form the whole of his knowledge.

How, then, do we acquire this universal belief in the existence of matter, seeing that we are forced to admit we know of nothing but the existence of mind? It is by a special quality of matter not yet named, which Mill has called the *permanent possibility of sensation*. In the example given above of the tree in the South Sea island, this was vaguely apparent. We believed in the existence of the tree as apart from any percipient mind, because it was admitted by hypothesis that *if there had been a mind present* it would have perceived the tree. So with ourselves, we look at a house and go our ways, perfectly well knowing that if we go back to the same place (all things being the same) we shall find the house just as before. Moreover we know (by the special quality of matter as to its likeness of effect on all minds, previously discussed in this article) that if we send some one else, he will also perceive the house. The house is therefore a permanent possibility of sensations, and it is conceived as external to ourselves because we can send others to see it while we are ourselves far away. Our own sensations of matter may cease, but the possibilities of sensation remain, apart from us, independent of our will and of our presence. We cannot, by the very nature of our mind, resist the conclusion that these possibilities of sensation reside in something apart from us, and in something actually existent. The articles *MATERIALISM* and *MIND* may be with advantage referred to in connection with the present article.

The consideration of matter on its physical side, its aggregation in molecules, &c., is dealt with under the articles *MOLECULE* and *ATOMIC THEORY*.

**MATTERHORN** or **MONT CERVIN**, a mountain of the Pennine chain of the Alps, at the head of the Valley of Zermatt, being 14,706 feet high. It rises in a vast irregular pyramid to a height of more than 7000 feet above the plateau which closes the valley, and is by far the most imposing object in the Alps. It is so steep in most parts that very little snow lies upon it. The ascent, long considered impossible, was first made by Edward Whymper in 1865, together with Messrs. Hudson and Hadow (who were killed by a fall in descending). The rock is of granitic gneiss, pervaded by granite veins; and the existing form is probably due chiefly to the action of currents swelling round it, while the land was slowly rising, and bearing away the softer strata.

**MATTHEW, GOSPEL OF ST.** See *GOSPEL*.

**MATTHEW OF PARIS**, one of the chief of our chroniclers of the thirteenth century, probably derived his surname from having at some time studied at Paris, then the leading university of Europe. See *CHRONICLE*.

**MATTHIOLA**, a genus of plants belonging to the order *CRUCIFERÆ*, and consisting of annual and perennial herbaceous plants inhabiting the warm countries bordering

the Mediterranean, and extending eastwards into Persia and some of the southern provinces of Siberia. Among the species are those which form the stocks and gilliflowers of gardens, sweet-scented biennials much valued for the beauty and variety of their many-coloured flowers. The principal source of these has been *Matthiola incana*. See STOCK.

**MAUCE LINE**, a small town of Scotland, in the county of Ayr, situated on an eminence 1 mile north of the river Ayr, and 27 miles south by west of Glasgow. The town is neat and old-fashioned. Besides the parish church, the Free church, and the United Presbyterian church, there are no buildings of any importance. There is an endowed educational institution, public library, and temperance hall. The chief modern interest of the town centres in Mossiel, the farm on which Burns resided, which is in the immediate vicinity, and in the local allusions in the poet's works. It was here that Jean Armour lived before her marriage. Population of the parish in 1881, 2504; of the town, 1616.

**MAULMAIN** or **MOULMEIN**, a town and headquarters of Amherst district, and of the Tenasserim division, British Burma, is situated on the left bank of the Salwin, at its junction with the Gyaing and Attaran rivers. Immediately to the west is Bhilu Gywon, a large island, which protects the town from the monsoon, but shuts out all sea view. To the north, on the opposite bank of the Salwin, is MARTAHAN, once the capital of a kingdom, but now an unimportant hamlet. The inhabitants are almost entirely Europeans, Eurasians, Chinese, and natives of India. The total population is about 60,000. The principal buildings are—Salwin House, originally a private residence, but now the property of the municipality; the hospital; the Protestant and Roman Catholic churches; the custom-house, and other public offices; the barracks for the garrison of Madras Native Infantry. When this part of the province was ceded by the treaty of Yandabu (1826) Amherst was first designated as the capital of the newly-acquired territory, but Maulmain was afterwards chosen as being the best site strategically, and also on account of its being well supplied with water. In a few years Maulmain, from being a waste, developed into a thriving commercial town. A large trade in teak (of which there are extensive forests in Amherst district) soon sprang up, and for many years timber was the only article of export. With the gradual settlement of the country and increase in agriculture, rice and cotton began to be also exported. Besides these, the other staple exports are hides, horns, lead, copper, and stick-lac. The principal imports are cotton-twist and yarn, cotton and woollen piece-goods, wines, beer and spirits, sugar, and betel-nuts.

**MAUND**, the name of a weight used in the East Indies, which varies in different provinces; but the ordinary Indian bazaar maund is 82½ lbs. The Bombay maund is 28 lbs.; the Surat, 41 lbs.; the Madras, 25 lbs.; and the Bengal factory maund, 74 lbs. 10 oz.

**MAUNDY THURSDAY** is the Thursday preceding Easter. According to the best authorities the word maundy is derived from Lat. *mandatum*, command, the first word of the service appointed in the Missal for that day, and derived from the new commandment of John xiii. 84. Another account is that the name is derived from the Old English *maund*, a large basket, such baskets being used to contain the gifts made to the poor on that day; and yet further it has been traced to the Fr. *maundier*, to beg. From a very early period two customs have been connected with this day, first, the ceremony of washing the feet of poor persons, and second, the distribution of alms to the poor. Giving a literal interpretation to the precept of Christ given to the disciples "to wash one another's feet," many pious persons, especially those of high station in the church or state, have practised the washing of the feet of twelve poor persons, and the custom is still observed in many countries. The last English sovereign to perform

the ceremony was James II., but it is still annually performed by the Pope, the Emperor of Austria, the King of Bavaria, and some other Roman Catholic sovereigns of Europe, as well as by the Emperor of Russia as the head of the Greek Church. The practice of distributing alms and gifts to the poor was not confined to high dignitaries, but was also practised by devout persons of lesser degree. In England the gifts of food, clothing, and money were changed in 1838 to a regular money payment, and this is still maintained. In the Roman Catholic Church Maundy Thursday is the day on which the consecrated oil used in the administration of baptism, confirmation, and extreme unction, &c., is blessed by the bishop in a very elaborate and solemn service appointed for this purpose, and on which the altars are dismantled in preparation for the observances of Good Friday.

**MAUPERTUIS, PIERRE-LOUIS MOREAU DE**, was born at St. Malo, 17th July, 1698. Upon quitting the army he applied himself assiduously to the study of mathematics and astronomy. In 1723 he was admitted a member of the Royal Academy of Paris, and in 1727 a member of the Royal Society of London.

Maupertuis was one of the first among his countrymen who defended the Newtonian theory against the attacks of Descartes. When Frederick II. was about to re-organize the Academy of Berlin, he offered the presidency to Maupertuis, who accepted it. But his residence at the court of Prussia, which dates from 1745, seems to have been chiefly occupied in cultivating the good graces of Frederick, and he showed but little interest in scientific research. He died at Basel, 27th July, 1759, at the house of the sons of John Bernoulli.

**MAURICE DE SAXE**, Marshal of France. See SAXE. **MAURICE, ELECTOR AND DUKE OF SAXONY**, was born in 1621. In 1642 he married Agnes, daughter of the Landgrave of Hesse. Although a zealous Protestant, as his father had been, Maurice served as a volunteer under the Emperor Charles V. In 1646, on the breaking out of the war between the emperor and the Protestant confederates, John Frederick, elector of Saxony, and the Landgrave of Hesse appeared on the latter side, for which they were duly outlawed by imperial authority. Meantime Maurice had been secretly negotiating with the emperor and Ferdinand of Spain, the former of whom, as an inducement to support his cause, invited him to take possession of the electorate of Saxony. Maurice seems to have hesitated a little at this juncture; but as some negotiations which he established with the Protestants led to no result, he went boldly over to the emperor. During the long and active war which ensued, he distinguished himself greatly by his successes over his Protestant friends. In the following year (1647) the Elector of Saxony was taken prisoner at the battle of Muhlberg, and Maurice was solemnly invested in the electorate of Saxony in 1648.

In 1649 several charges having been made against him relative to his alleged attachment to popery, he refuted them in an able letter to his subjects. In 1650 he opposed the emperor through his representatives at the Diet at Augsburg, by protesting against the Council of Trent. In the same year, however, he was appointed to the command of the imperial army which besieged Magdeburg, where he met with considerable success, although he seems to have been willing to favour the inhabitants as far as possible.

In 1651, on the emperor summoning the states to the Council of Trent, Maurice caused the heads of his doctrines to be drawn up by Philip Melancthon; but he refused to send his divines unless a safe-conduct was granted them, not only by the emperor, but by the council itself. Towards the end of the year he held a convention in his own states to make peace with Magdeburg, which was eventually concluded.

In the meantime he had not forgotten the Landgrave of

Hesse, who had remained in prison since 1547. After in vain praying the emperor for his restoration to liberty he entered into negotiations with the King of Denmark and many of the German states, and also with the King of France. In 1552 he left the emperor's cause in disgust, took the field with the Protestant princes, and achieved a brilliant campaign. The result was the celebrated treaty of Passau (12th August, 1552), which restored to the Protestants the free exercise of their religion and the rights of which they had been deprived since the victory of Mühlberg.

Maurice now turned his arms against Albert, duke of Brandenburg, who had repudiated the treaty, and defeated him at Sievershausen in Lüneburg, but fell mortally wounded in the engagement (11th July, 1553). He left behind him the renown of a sagacious statesman, a subtle diplomatist, and a great captain.

**MAURICE, JOHN FREDERICK DENISON,** was the son of a Unitarian minister of high repute for his zeal and philanthropy, and was born on the 29th August, 1806. He was sent at an early age to Trinity College, Cambridge, where he had for tutor Julius C. Hare, and where he formed an intimate friendship with John Sterling—a friendship which lasted through the whole of Sterling's life, and was made all the closer in the end by the marriage of the friends to two sisters. From Trinity College both Maurice and Sterling "migrated"—to use the university phrase—to the smaller body of Trinity Hall, where Mr. Maurice began to exert that singular influence, partly moral and partly intellectual, upon those with whom he was brought into contact, which marked him in after-life. Being a conscientious dissenter from some of the doctrines of the Thirty-nine Articles, he was at this time unable to take his formal degree; but he passed the usual examinations with distinction.

Having removed from Cambridge to London with the purpose of following a literary career together with his friend Sterling, he quickly obtained an introduction to the *Athenæum*, for which he wrote largely on matters of literary criticism, and which for a short time he edited. About the same time he came before the world as the author of a novel of a thoughtful and striking character, entitled "Eustace Conway." Meantime, his religious views and belief had gradually gone through some modifications; and, aided by the influence of Coleridge, he began to concentrate his attention upon theology. The result was that he gradually saw his way to subscribe to the Articles, and to follow a path of practical activity as a minister of the church. Being resolved on going through the whole course of training he entered Exeter College, Oxford, taking his degree in 1831 and being ordained in 1834.

His ministerial duties commenced in the curacy of a small parish in Warwickshire, where he resided from 1834 to 1836. In the latter year he was chosen chaplain of Guy's Hospital, and he fulfilled the duties of that post for ten years with indefatigable zeal and earnestness. About this time appeared one of the most important of Mr. Maurice's earlier works, "The Kingdom of Christ; or, Hints on the Principles, Ordinances, and Constitution of the Catholic Church, in Letters addressed to Quakers." In this work—which was originally published in 1838, but was largely re-modelled in a second edition, which appeared in 1842—the writer draws out an elaborate exposition of the nature and constitution of the Christian Church and its intended relations to the great human family.

~ In 1846 Mr. Maurice was chosen to deliver the course of lectures founded by Bishop Warburton at Lincoln's Inn, and in the same year he was appointed chaplain of that society. He continued to hold this post down to the year 1860. Meantime he had been leading in other quarters a very active and laborious life; for instance, since 1840 he had held the professorship of modern history and English

literature in King's College, London; and in 1816 he added to this the professorship of ecclesiastical history in the same institution. He was further nominated by the Bishop of London, Dr. Blomfield, to preach the Boyle Lectures in 1845-46. The fruits of his labours in these various fields of duty appeared from time to time in several volumes of "Sermons" and "Lectures" which he gave to the world.

He wrote also on the various phases of the Tractarian controversy in the days when John Henry Newman was the centre of thought in Oxford. Upon the question of the policy of enforcing subscription to religious *formule* he published, shortly after entering holy orders, a pamphlet entitled "Subscription no Bondage." In this essay he maintained that the Thirty-nine Articles were intended to be guides to a course of manly studies in ethics, theology, and Christian literature, and to protect students from the acceptance of superstitions which would interfere with the freedom of their inquiries.

In 1853 he published a volume of "Theological Essays," which at once provoked much angry and hostile criticism, and also led to serious consequences to himself. In this work Mr. Maurice contended against the ordinary doctrine of the endlessness of future punishments as inconsistent with the gospel of Christ's redemption, and as founded upon an Arian abuse of the word "eternal." The publication of this volume provoked a storm of opposition from more than one section of the church, and one of its results was, that the author was in the same year dismissed from the two professorships which he had held hitherto in King's College. In the succeeding year he published his "Lectures on the Ecclesiastical History of the First and Second Centuries," founded on notes of extempore lectures which he had formerly delivered at King's College, remodelled and prepared for the press by himself. For many years he had been earnestly striving to ameliorate the lot of the working classes, and about this time he began to advocate a system of social combination among working men on Christian principles. On this subject he delivered a series of lectures at Willis' Rooms in 1854, and he had the satisfaction of seeing these principles practically embodied and exemplified in the establishment of the Working Men's College in Great Ormond Street, the principalship of which he held for many years, and over which he continued to watch to the last with undiminished interest.

In 1860 he was appointed by Mr. Cowper minister of St. Peter's chapel in Vere Street, Cavendish Square, where his sermons were remarkable for their earnestness and thoughtfulness, but, above all, for their power of awakening thought in others. This incumbency he resigned in 1869, and for the last five years of his life he held the professorship of moral philosophy at Cambridge. He died in London, 1st April, 1872.

It is too early yet to estimate clearly the influence exerted by Maurice upon the Church of England, and upon the religious world generally. Few people have been able to accept his peculiar theological doctrines, and yet the direction which theological study has pursued since his time is largely owing to the new departure caused by his writings. Profoundly convinced of the unworthy conception of God involved in the Augustinian system, it was his aim to set forth in opposition to it the great truths of the fatherhood of God and the all-embracing nature of the Divine love. In his own day fiercely assailed as a heretic and a dangerous man, his name is now used to signify departures from orthodoxy of a mild and unimportant character, a significant proof of the change effected in the tone of theological speculation. In connection with the cause of education his name will ever be remembered with honour, and his success in the founding of the useful and valuable Working Men's College has already been noticed. At King's College and at Cambridge his influence was of the most

stimulating and healthful kind. As a teacher he was never content merely to impart knowledge; it was his aim to awaken in his pupils a desire for instruction, and to set them upon a path of direct personal inquiry and acquisition. In the work of social reform, upon which he spent so large a portion of his time and energy, he accomplished much that was of direct and immediate value, and he opened the way for improvements in the lot of the working classes which are still being developed. His personal influence also was very great over all with whom he came in contact, and though he dreaded becoming the founder of "a school," there were many earnest ardent workers who gathered round him, and, like Charles Kingsley, delighted to call him "master" and look up to him for direction and counsel. Strong, pure, devout, self-denying, and consumed with zeal for the welfare of others, he embodied one of the highest types of Christian character, and proved by his career the possibility of the attainment of the highest saintly virtues in spite of the controversy, strife, and turmoil involved in an active public life in the present day. (See "Life of Frederick Denison Maurice," by his son, Colonel Maurice, two vols., London, 1884.)

**MAURICE OF NASSAU.** See ORANGE.

**MAURITIUS, ISLAND OF,** called also *Isle de France*, is situated in the Indian Ocean, between 19° 58' and 20° 33' S. lat., and between 57° 18' and 57° 48' E. lon. Its length is about 36 miles, breadth 20, and area 713 square miles. The population in 1881 was 360,360. It has been largely increased, out of all proportion to the natural growth, by the importation of Indian labour, and the coolies now constitute a large proportion of the people. Though the traffic in labour is under government control, there has been much injustice, and the management and protection of the coloured population is one of the most difficult problems the authorities have to solve. The whites of the island are chiefly of French extraction, and many of them speak the French language. The dependencies on Mauritius are Seychelles, the Chagos Archipelago, Rodriguez, and some other small insular groups, of which collectively the population is 13,000.

Mauritius is surrounded by a coral reef, generally running parallel to the shores, at the distance of 1 or 2 furlongs, and mostly dry at low water. In this reef occur eleven breaks, by the greater number of which vessels of considerable burden may approach the island. The water between the reef and the shores, being less agitated than the open sea, affords facilities of communication between the places along the coast. The aspect of the country, from whatever quarter it is approached, is singularly abrupt and picturesque. The land rises rapidly from the coast to the interior, where it forms three chains of mountains, from 1000 to 2700 feet in height, intersecting the country in different directions. The greatest elevations are the Pouce, 2650 feet, and the Pieter Botte, 2676 feet, in the north-west range; the Montagne de la Rivière Noire, 2711 feet, in the south-west range; and the Piton du Milieu de l'île, nearly at the centre, 1932 feet in height. The island is clearly of volcanic origin. At Flacq the flow of the lava currents is distinctly seen, and these streams can be traced to the central districts. Port Louis appears to lie in an extinct crater, the Vallée des Prêtres in another, and there are signs of at least ten others. Formerly Mauritius was looked upon as the most healthy of all our tropical possessions, but of late years the island has been subject to several terrible epidemics.

In addition to flowers and fruits of almost every kind, the soil of Mauritius grows wheat, maize, yams, and manioc; but commercial prosperity is almost entirely dependent on the sugar crops, a source of trade so fluctuating that the island is constantly subject to seasons of depression. The exports vary considerably according to the nature of the sugar crop. In prosperous years they are valued at

nearly £4,000,000, but they sometimes reach less than £3,000,000. The imports are valued at something less than £2,500,000 per annum. A large portion of the trade is with Madagascar and India, and live-stock is imported from the Cape, Spinn, Burma, and Bombay. The revenue and expenditure are each about £700,000 per annum, and there is a public debt of nearly £1,100,000, which has been chiefly incurred for the construction of railways. Horses are few, and seldom bred. Mules and asses are more numerous, and principally used for the saddle. Cattle, goats, sheep, hogs, and fish abound. The dodo, an extinct bird, was exclusively confined to this island. See DODO.

At the end of 1867 a fever broke out in the island which carried off large numbers of the population, owing chiefly to the absence of proper sanitary arrangements; but improvements have since been made in these respects. A fearful hurricane devastated the island on 11th and 12th March, 1868, when out of fifty vessels in the harbour of Port Louis only three escaped without destruction or damage, and in the town several churches and hundreds of houses were reduced to ruin, so that 50,000 persons were rendered utterly houseless.

The government of the Mauritius and its dependencies is vested in a governor, aided by an executive and a legislative council, consisting of seven official and eleven non-official members, the latter chosen from the landed proprietors and principal merchants of the island. All their Acts are subject to the approval of the British government. The principal towns in the island are Port Louis, the capital, and Mahébourg.

Mauritius was discovered by the Portuguese in 1505. The Dutch surveyed it in 1598, and planted a settlement in 1640, naming it in honour of Prince Maurice, but they abandoned it in 1708. In 1715 the French took possession of it, formed a settlement at Port North-west, and called the island *Isle de France*. They remained in its undisturbed possession till the year 1810, when it was taken from them by the British, who since the peace of 1814 have retained it. This island is the scene of St. Pierre's well-known romance of "Paul and Virginia."

**MAUSOLEUM,** a term applied in modern times to a sepulchral chapel or edifice erected for the reception of a monument; but it originally designated the magnificent structure raised by Artemisia as the tomb of her husband Mausölos, king of Caria, at Halikarnassos, 352 B.C. This monument is referred to as being still in existence in writings of the twelfth century, but when Halikarnassos, in 1404 A.D., passed into the possession of the Knights of St. John of Jerusalem, they found only a few ruins remaining, which they utilized in building their castle. From Pliny's description it appears to have been nearly square in its plan, measuring 113 feet on its sides, and 93 on each of its ends or fronts, and to have been decorated with a peristyle of thirty-six columns (supposed by Hardouin to have been 60 feet high, or upwards), above which the structure was carried up in a pyramidal form, and surmounted at its apex by a marble quadriga executed by Pythis, who, according to Vitruvius, was joint architect with Sátyros in the building. It was further decorated with sculptures and reliefs by Skopas, Bryaxis, Timotheus, and Lecharès. The entire height was 140 feet. In 1838 some bas-reliefs which had been built into the walls of the castle of the Knights of St. John were removed by Lord Stratford de Redcliffe to the British Museum; and in 1856 extensive excavations were begun by Consul Newton, by which the whole of the foundations were laid bare, and many important fragments of sculpture were recovered. These are now preserved in a handsome room built to receive them at the British Museum, and are of the greater interest in that by their help the shape of the original monument has been largely restored.

The mausoleum erected at Babylon by Alexander the Great, in honour of Hephæstion, appears to have been still more magnificent. Those of Augustus, in the Campus Martius, and Hadrian, at Rome, were structures of great magnitude and grandeur, and resembled each other in being circular in plan. Hadrian's is now converted into the Castle of St. Angelo, in which shape it is familiar to almost every one.

Such places as Henry VII.'s Chapel and the Pantheon or the Escorial may also be considered as mausoleums; but the term is generally restricted to a detached edifice erected merely as a private burying-place or to contain tombs. A beautiful mausoleum has been erected by Queen Victoria at Frogmore, at a cost of over £200,000, where the remains of the Prince Consort and the Duchess of Kent have been interred; and a handsome edifice of this nature, which is said to have cost £100,000, adorns the grounds of the Duke of Hamilton, at Hamilton, in Lanarkshire. Perhaps, however, the finest and most costly mausoleum ever erected in the world is to be found in the Taj Mahal, built by Shah Jehan to the memory of his wife Arjmand Bauu, for a description of which the reader is referred to the article AGRA.

**MAUVE.** See DYEING.

**MAVIS**, the name given in Scotland to the *Turdus musicus*, thrush, or song-thrush, which inhabits every European country, being permanent in Britain and spread over the three kingdoms. It haunts gardens and woods near streams and meadows. Its song is sweet and has considerable compass; it can be made to repeat musical airs, and, in some instances to articulate words.

**MAXENTIUS**, Roman Emperor from A.D. 306 to 312. His full name was *Marcus Aurelius Valerius Maxentius*. Maxentius was the son of the Emperor Maximian, the colleague of Diocletian, but was not named for the succession when those great princes abdicated (305). He therefore raised his standard, and was proclaimed emperor by the troops at Rome. His father, Maximian, joined him at his request and resumed his crown. After defeating Galerius, his rival in the empire, and freeing himself from his father's control, he brought Africa under his dominion and began to aspire to control the entire West. Constantine, who was his brother-in-law, had put Maximian to death for complicity in plots against himself, and Maxentius, under pretext of avenging his father's death (about which he cared nothing), marched upon Gaul. Constantine came to the encounter, and it was on his march that he saw the vision of the cross, which promised him victory, and which converted him to Christianity. He met Maxentius at the Milvian Bridge, near Rome (Saxa Rubra), 27th October, 312; and a sanguinary conflict ended in the total defeat of Maxentius and his death in the river as he tried to cross into Rome by the bridge. His career is no doubt blackened by the flattery of Constantinian writers, but he stands before us in their pages as a monster of cruelty and lust, reigning only by virtue of immense bribes to the army.

**MAXIMILIAN** (*Maximianus*), Emperor of Rome from A.D. 286 to 305, was born in Pannonia (Western Hungary), of humble parents. His full name was *Marcus Aurelius Valerius Maximianus*. His military abilities were so great that he quickly attracted the notice of the Emperor Diocletian, which far-seeing man, recognizing that the vast overgrown empire needed a soldier for its master, created this man first Cæsar (285), and then full emperor in conjunction with himself (286). Maximian was set to rule the Western Empire, more exposed to the onslaughts of the barbarians, while Diocletian governed the East. Still the empire seemed unsafe, and in 292 Constantius Chlorus and Galerius were proclaimed Cæsars (vice-emperors), ruling Gaul with Britain and Spain, and Illyria and the Danube frontier respectively. When Diocletian resolved to abdicate

in favour of younger and more active princes, he compelled Maximian to do the like (305); but the latter's son, Maxentius, having usurped a share in the empire, recalled his father to the throne (306). They quarrelled, but on the other hand the young Emperor Constantine married Maximian's daughter Fausta, and invited him to reside in Gaul. In 308 Maximian thought he saw the chance to return to real power, and vainly attempted to seize part of the imperial sway. Two years later (310) he tried to suborn his daughter to murder her husband. She revealed the plot, and Constantine condemned Maximian to death. He was allowed to destroy himself.

**MAXIMIAN** was also the name of the Emperor GÁLERIUS. **MAXIMILIAN I.**, Emperor of Germany, or more strictly of the Holy Roman Empire, from 1459 to 1519, was son of the Emperor Frederick III. He was born in 1459, acquired the ultimate inheritance of the vast Burgundy possessions by his own marriage in 1477 with Mary of Burgundy (daughter of Charles the Bold) and of Spain by the marriage of his son Philip to the Infanta Joanna in 1496. He later on inherited Tyrol and a large part of Bavaria. As regards his own empire he was a brilliant ruler. It is to him that the Reichs-kammer and the Reichs-hofrath (the Imperial Chamber and the Aulic Council) owe their existence; he founded a standing army, a system of police and justice, regulated the universities, and made literature and scholarship flourish. He was not content with these peaceful triumphs of liberal government and of diplomacy, but also contended with Charles VIII. and his successor, Louis XII. of France, for the mastery of Italy, and in 1499 he went to war with Switzerland also. But in both enterprises he was very unsuccessful, and the Swiss may be said to have then achieved their independence of the empire. He did better in unwarlike operations. By the marriage of his grandchildren with the heirs of Hungary and of Bohemia he laid the foundation for the addition of those crowns to that of Austria in the fulness of time. He was a great and splendid prince. At his death, in 1519, the empire passed to his grandson, Charles of Spain (Charles V.)

**MAXIMILIAN II.**, son of Ferdinand I., was emperor of the Holy Roman Empire from 1564 to 1576. He showed himself liberally tolerant of Protestantism in his dominions in spite of the never-ending pressure of the Jesuits.

**MAXIMILIAN FERDINAND**, Emperor of Mexico, was born 6th July, 1832. He was the brother of the Emperor Francis Joseph of Austria. In 1857 he married the Princess Charlotte, daughter of King Leopold of Belgium. He entered the Austrian navy in 1846. He was also for some time governor of the Lombardo-Venetian provinces. On the 10th April, 1864, he accepted the crown of Mexico, which had been offered him by the Mexicans in the previous October. The young emperor and empress landed at Vera Cruz on the 24th of May, and made their entry into the capital of Mexico on the 24th June. For three years, supported by a large French force, the emperor applied himself diligently to the organization of the empire. The remonstrances of the United States government—who had always been annoyed at the attempt made to found a new empire in such close proximity to their country—at last compelled the Emperor of the French to withdraw the troops which had really kept Maximilian on the throne. Maximilian refused to leave with them, although it was certain that a rebellion would immediately break out, headed by Juárez, the former president of the Mexican Republic. The event took place in February, 1867, and Maximilian gallantly placed himself at the head of his army to endeavour to quell the rising. He was, however, treacherously betrayed into the hands of his enemies at Queretaro, and after a trial by court-martial was shot on the 19th June. The sad fate of the empress, who had returned to Europe in the previous year, and now quite lost

her reason, completed one of the most tragic stories of modern times. At the earnest solicitation of his brother, the Emperor of Austria, the remains of Maximilian were given up to the commander of an Austrian frigate, and brought to Vienna for interment.

**MAXIMILIANA** is a genus of PALMS, natives of tropical America. Humboldt described them in glowing terms—"Nature has lavished every beauty of form on the *Jagua* palm. . . . Its smooth, slender trunks, rising to between 64 and 75 feet, appear above the dense mass of foliage of other kinds of trees, from amidst which they spring like raised colonnades, their airy summits contrasting beautifully with the thickly-leaved species of *Ceiba*, and with the forests of *Laurinææ*, *Calophyllum*, and different species of *Amyris*, which surround them. Its leaves—few in number, scarcely so many as seven or eight—rise almost vertically into the air; their extremities are curled like plumes, the ultimate divisions, having only a thin grass-like parenchyma, flutter lightly and airily round the slowly-balancing midrib of the leaves." Spruce gives the length of a leaf as 84 feet, and says that there were about a thousand fruits clustered on one stalk (spadix), forming a load for two men. The spathe, which incloses the spadix in the young state, becomes woody, and is used by the Indians as baskets, and even as vessels in which to boil their meat. The fruit, which is of a brownish colour, is eaten by the natives, as well as by monkeys and birds. It contains a single stony seed, and these are used as fuel to smoke and dry the India-rubber when fresh from the tree.

**MAXIMIN** was the name of two emperors of Rome. The first was *Caius Julius Verus Maximinus*, a barbarian, his father being a Goth and his mother a German. He reigned from 235 to 238. He was noticed for his enormous strength and stature (said to be 8 feet) at some military sports by the Emperor Septimius Severus, was enlisted in his body-guard, and rose to high command by the emperor's fancy. On the death of the Emperor Alexander Severus, Maximin was proclaimed emperor by his soldiers (A.D. 235). He proved a mere brute, unable to rule, but able to tyrannize and oppress. The Gordians, father and son, were acknowledged as emperors by the Senate, and when Maximin advanced against the senatorial forces his own soldiers assassinated him (238).

The second Maximin was one of the colleagues of Constantine in the empire. His name was *Daca*, but on being adopted by his uncle, the Cæsar Galerius (afterwards emperor), he took the name of *Galerius Valerius Maximinus*. He had been a shepherd, but rose rapidly to great military commands. He was created Cæsar by his uncle at his accession to the empire in 305, and was made his colleague in the empire in 308. Galerius died 311, and Maximin divided the Eastern Empire with Licinius. He invaded the latter's territory during his absence at Rome, but this provoked the return of Licinius, and Maximin lost his throne and his life. He was a cruel voluptuary, and a bigoted anti-Christian.

**MAXIMUS**, the most famous of the families of the great Fabian gens of republican Rome. See **FABIAN** GENS.

**MAXIMUS**, Emperor of Britain, Gaul, and Spain, from 383 to 388, was by birth a Spaniard, and was named *Magnus Clemens Maximus*. He was serving in Britain, and was proclaimed emperor by his troops, 383. He defeated and put to death the Emperor Gratian in Gaul. Theodosius, emperor of the East, accepted his claim to empire, and gave him Britain, Gaul, and Spain, while Valentinian ruled Italy. Maximus, determined to be sole ruler of the West, advanced against Italy and drove out his rival. Theodosius upon this set out with a large army, took Maximus prisoner at Aquileia at the head of the Adriatic Sea, and put him to death A.D. 388.

**MAXIMUS**, **PETRONIUS**, was the name of another Roman

emperor, who reigned a few months in the year 455; he assassinated Valentinian III., and married his widow. The latter invited Genseric and his Vandals to invade Italy, and on his doing so Maximus was slain during a retreat.

There was also a Maximus (*M. Clodius Pupienus Maximus*) who was emperor by decree of the Senate for a short time in 238; and another of this name who temporarily assumed the title in 408, and again in 418. His second attempt cost him his life.

**MAXWELL**, **JAMES CLERK**, a distinguished modern physicist, was born at Edinburgh in 1831. He was educated at the Academy and University of Edinburgh, and in 1850 went to Cambridge, where in 1854 he took his degree as second wrangler. In 1856 he became professor of natural philosophy at Marischal College, Aberdeen, and in 1860 he was appointed professor of physics and astronomy in King's College, London. This position he resigned in 1868, but in 1871 he was made the first professor of experimental physics at Cambridge. He died 1879.

As a scientific discoverer and mathematician Maxwell must be placed in the first rank of the men of his time, and his researches extend to nearly all the branches of physical science. In 1859 he gained the Adams prize for a paper on the "Stability of Saturn's Rings," and for his investigations in relation to the perception of colour he received the Rumford medal in 1860. As an experimenter and mathematician he did more than any other modern investigator to establish the kinetic theory of gases, and he published in 1871 his celebrated book on the "Theory of Heat," which has become a standard work upon the subject, and has already passed through several editions. He also issued an elementary treatise on "Matter and Motion" in 1877, a work displaying great originality and power in the handling of those subjects; but his highest powers were devoted to the study of electricity, and it is in connection with this subject that his greatest achievements were accomplished. Starting with the ideas suggested by Faraday he passed on to new and original investigations of his own, and in 1873 he gave the results to the world in his great treatise on "Electricity and Magnetism," a work which will for ever associate his name with the study of these sciences. In this occurs his celebrated theory accounting at once for the phenomena of light, electricity, and magnetism by modes of motion propagated through a medium of a certain definite mechanical construction. In private life he was a man of a generous and lovable disposition, and a sincere and devout Christian. A memoir, written by his friend Professor Campbell, was published in 1885, with a selection from his works.

**MAY**, the fifth month of our present year, was the third in that of Romulus, and the fifth in the calendar of Numa Pompilius. It consisted of thirty-one days in the calendar of Romulus; and of thirty in that of Numa. Julius Cæsar restored to it the odd day of which Numa had deprived it, and of which it still keeps possession. It is *Maius*, the growth month, a form of the word of which the Aryan root is  $\sqrt{\text{MAGH}}$ , with the meaning of power, the classical root being *Mag* (as *magnus*, great, &c.), and the Teutonic *mah* (as *mah-ta*, night, &c.)

*May-day*, the first day of May, was formerly celebrated in England with many rites, such as pulling off branches of trees, adorning them with nosegays and crowns of flowers, dancing round a pole decked with garlands, &c. The Roman youths used always to spend May-day in the fields dancing and singing, with garlands and flowers, in honour of Flora, to whom the month was specially devoted. We ourselves have at least one semi-religious May-day observance, for it is a time-honoured custom at Oxford for the choristers to ascend at early morn to the top of the noble Magdalen Tower, and from thence usher in the spring on May-day with a short choral service.



But the milkmaids' May-day dance round a trophy of plate with their garlanded pails one mass of flowers, the Jack-in-the-green of the chimney-sweepers, and such secular jollities have now almost disappeared, along with the sweet old superstition of bathing the face in May-day dew, as a cosmetic to gain or to enhance beauty. A divination by snails on May-day was, until lately, practised in the country, the track of the animal being examined to form letters from it in answer to questions put. A very interesting fire-ceremony (now practically extinct), formerly universal in Scotland on May-day, is described in the article BELTEIN. In England the beautiful custom of the May-pole with its tall garlanded and decorated shaft, stowed away the rest of the year under the eaves of the houses upon hooks and set up on May-day, was never omitted in the middle ages. The Puritans, to whom we owe the loss of so many of our public games, and so much of our merriment, ordered all May-poles to be destroyed by Act of Parliament in 1644, as "a heathenish vanity, abused to superstition and wickedness," and fined the constables *£*s. weekly as long as they stood. Morris-dancing, masquerading, mock tournaments with hobby-horses, and the more orderly dancing of youths and maidens all centred round the May-pole of the parish on May-day.

**MAY HILL SANDSTONES** are the basal beds of the Upper Silurian formation. They have been so named from the locality where their typical development occurs—May Hill in Gloucestershire; here they rest unconformably on Cambrian rocks, but in some other sections their equivalents—the Upper Llandovery beds—succeed quite conformably the uppermost member of the Cambro-Silurian formation, namely, the Lower Llandovery beds.

**MAYA CÆÆ**, a small order of plants, belonging to the *MONOCOTYLEDONS*, cohort *Commelinales*. There are only seven species, natives of America, prostrate leafy herbs, creeping in damp woods or floating in fresh water. The flowers are inconspicuous, and arranged in terminal heads. The perianth consists of six parts, the three outer being green, the three inner of a white, pink, or violet colour. There are three stamens; and the ovary is one-celled, with three parietal placentas and numerous orthotropous ovules. The seed has a small embryo in farinaceous albumen.

**MAY-APPLE** (*Podophyllum peltatum*) of North America, is a useful plant, with an agreeable fruit, but the leaves are poisonous and the root-stock cathartic. It is chiefly cultivated for the sake of the active medicinal properties of the root-stocks. The extract is considered a valuable substitute for mercurials, acting as powerfully as mercury, without its evil consequences. The May-apple has a large, white, nodding flower, stamens twice as many as the petals, and a yellowish fruit, called "wild lemon," with the seeds attached to one side.

**MAYENCE.** See *MAINZ*.

**MAYENNE**, a department in France, is bounded N. by the departments of Manche and Orne, E. by the department of Sarthe, S. by Maine-et-Loire, and W. by Ille-et-Vilaine. It approaches in shape to a rectangle, 51 miles long by 40 wide. The area is 1996 square miles, and the population in 1886 was 340,043.

**Surface and Products.**—The surface of the department is strewn with hills, and in some places cut up by valleys and ravines. From a distance the country has the appearance of a vast forest, such is the number of trees planted in the hedgerows that inclose each field. The population of Lower Maine does not, as is the case in most parts of France, live in hamlets or villages, but is scattered among isolated farmhouses, each of which stands among thick hedges, and contains a family that is supplied with every necessary of life, both of food and clothing, from the land and their own industry. This isolated and independent existence has left its impress on the people in a certain

rudeness of address, an honest but obstinate adherence to old usages, and a consequent aversion to improvements. The soil in the arrondissement of Château-Gontier, and in part of that of Laval, is productive in bread-stuffs of all kinds; and sufficient corn for home consumption is raised. Meadow land is scanty, nevertheless a great number of beasts are fed, which form a source of considerable profit to the farmer. Flax, hemp, and fruit trees are extensively grown, and the vine is cultivated to a small extent, but the wine made is of inferior quality. Cider and perry are extensively made. The forests furnish timber for the navy. Well-wooled sheep, pigs, and fowls are numerous. Bees are kept in great numbers.

**Rivers.**—The department belongs almost entirely to the basin of the Loire, and is drained chiefly by the Mayenne (the ancient *Meduana*), which rises in the west of the department of Orne, and running nearly south past the towns of Mayenne, Laval, and Château-Gontier, divides the department of Mayenne into two pretty equal parts. It afterwards flows through *MAINE-ET-LOIRE*, and joins the Loiret on the right, near Angers. The total length of its course is 100 miles, for the last 45 of which it is navigable.

The department is traversed by the railway from Paris to Brest, which passes through Laval.

**Industry.**—Iron mines are worked for the supply of some smelting furnaces and forges. There are coal mines near Laval. Marble, granite, flint, building and lime stone, and slate are quarried. White sand, used in the manufacture of glass, is raised. Linen spinning and weaving are the chief manufactures; cotton stuffs, haircloth, linen thread, and paper are made.

The climate is healthy, and resembles that of the south of England. The department is divided into the three arrondissements—Laval, Mayenne, and Château-Gontier. The capital is *LAVAL*.

**MAY-FLY** is the name given to the common English species of the family of insects *Ephemeridæ*, which belongs to the order *NEUROPTERA*, and finds its nearest allies in the dragon-flies (*Libellulidæ*).

The May-flies or *Ephemeridæ* are beautiful delicate insects, with a long, soft, tapering body, and large, delicately-veined fore wings. The hind wings are small, and sometimes altogether absent. The antennæ are short and awl-shaped, composed of three points, the last of which is long and bristle-like. The mouth is so imperfectly developed, the jaws being membranous in texture, that no food can be taken in the perfect state. The legs are slender, the anterior pair being much elongated in the male; the tarsi are composed of four or five joints. The last segment of the abdomen bears two or three very long slender, many-jointed bristles.

The May-flies, when they have attained their final stage of metamorphosis and perfect form, are among the most fleeting of living creatures, existing often only a few hours, and propagating their species before they die. In this state they sometimes appear suddenly in myriads, during fine summer evenings, by the water-side, where they may be seen flitting about and balancing themselves in the air. The whole of this brief existence they spend on the wing, taking no food. The larval existence, however, lasts for two or three years. The larvæ have a long, flat body, long hair-like antennæ, and strong sickle-shaped jaws. The abdomen ends in moderately long feathery bristles, and its sides are fringed with expansions, serving the purpose of gills. The larvæ, in some cases, live freely in the water of ponds and streams, while others make furrows in the mud. They feed partly on living prey, partly on decaying animal or vegetable matter. They undergo numerous moults, acquiring more and more the structure of the perfect insect, so that the pupal condition is not sharply marked off from the larval: the number of these moults amounts sometimes to as many as twenty.



The stage that succeeds is remarkable. The May-fly, on first emerging from the pupal case, has its large wings free and capable of use, but they and the whole of the body are covered with an exceedingly delicate skin which conceals the true colour of the perfect insect. This *sub-imago*, as it is called, flies to some attachment, as a wall or the trunk or branches of a tree. Shortly the skin splits, the May-fly appears in its full beauty and flies away, leaving its ghost, as it were, clinging by its legs to the resting-place, the tail-bristles extended, and the wings shrivelled.

The May-flies are widely distributed through the temperate regions of the world. The species are numerous, and are divided into genera according to the number of wings and the setæ, or bristle-like appendages to the abdomen. Thus the genus *Ephemera* has four wings and three setæ; *Baetis* has four wings and two setæ; and *Cloëon* has two wings and two setæ. These setæ are of great use to the little insect in steering its way through the air whilst performing its beautifully undulating flight. The Common May-fly (*Ephemera vulgata*) is the trout-fly of anglers, the sub-imago being called by them the Green Drake, and the imago or perfect insect the Gray Drake.

**MAYNOOTH**, a village of Ireland, in the county of Kildare, situated on the Royal Canal and the Great Western Railway, 14 miles W.N.W. of Dublin. Its only importance arises from the Roman Catholic College of St. Patrick, founded 1795 by the Irish parliament, and endowed by an annual grant of £26,000 by the imperial legislature. On the disestablishment of the Anglican episcopal church in Ireland in 1871 this endowment was abolished, with all other ecclesiastical endowments in Ireland; but fourteen years' purchase (£364,000) was paid to the college in one sum in lieu of the grant, on the principle of compensating life interests.

**MAYO**, a maritime county of the province of Connaught, in Ireland, is bounded E. by Sligo and Roscommon, S. by Galway, and W. and N. by the Atlantic Ocean. Its greatest length E. to W. is 65 miles; its greatest breadth N. to S. is 75 miles. The area is 2060 square miles, or 1,318,129 acres. The population in 1881 was 245,212.

The coast-line, 250 miles in length, is indented with the Bays of Killala, Broadhaven, and Blackrod (the two last being separated from each other by the narrow isthmus of Behmullet), the entrance into the peninsula of the Mullet, Tulloghane Bay, Clew Bay (studded with numerous islets), and the Killeries. Near the coast are the islands of Achill, Clare, Inishturk, Inishbofin, and numerous other islets. The surface is of every character; much mountain and waste, and much level and fertile land. The summits of Mullrea, Nephin, and Croagh Patrick are 2680, 2580, and 2870 feet above high sea-level; on the summit of the last is a chapel dedicated to St. Patrick.

The soil is mostly light, and with the moist climate better suited to grazing than tillage. The subsoil in the level parts is limestone; in the others red sandstone, mica slate, granite, and quartz; iron ore abounds, but remains unwrought for want of fuel; there are several valuable slate and marble quarries. Lakes Conn, Curragh, Cullen, Castlebar, Carramore Fyogh, and some smaller ones, are within the county; those of Mask and Corrib border it on the south. The occupations are agriculture and fishing; pasturage is more attended to than tillage. The linen manufacture formerly flourished, but has declined. The salmon fishery on the Moy and the other rivers of the county is very considerable. The breeds of cattle and sheep are generally improved. The chief crops are oats, flax, and potatoes.

The only navigable river in the county is the Moy, which is one of the finest rivers of Ireland. There are no canals. Many good roads have been constructed during the present century, and the Midland Great Western Railway traverses part of the county. The coast fishery employs several thousand fishermen. Turbot, sole, cod, ling, hake, haddock,

plaice, oysters, lobsters, and herrings are caught. Under the Redistribution of Seats Act of 1885, Mayo returns four members to the House of Commons. Castlebar is the chief town.

The antiquities of the county are chiefly ecclesiastical. There are round towers at Killala, Tulogh, Meelick, and Balla. At Cong are the remains of a splendid abbey, originally founded in the seventh century. At Ballyhaunis are the ruins of a largely-endowed abbey, founded by the family of Nangle. Very fine remains of a Franciscan friary at Moyne, founded by William de Burgh, are still standing. Rossek Abbey, in the same neighbourhood, built by the Joyces in the fifteenth century, is another very striking ruin. The remains of Ballinutuber Abbey, 7 miles from Ballinrobe, are among the most elegant specimens of early architecture in Ireland. Numerous other remains of religious houses founded by the families of De Burgh, O'Malley, and Nangle are found throughout the county. The military antiquities are not in general of much extent or interest. Carrig-u-Nile, Doona Castle, Iver Castle, and Doonbriste Castle are the principal.

**MAYO, RICHARD SOUTHWELL BOURKE, EARL**, Viceroy of India, was the sixth Lord Mayo, and was born in Dublin in 1822. He was educated at Trinity College, Dublin, and entered Parliament in 1847 in the Conservative interest as one of the members for the county of Kildare. He afterwards represented Coleraine and Corkermouth. He was three times chief secretary for Ireland under Lord Derby, in 1852, 1858, and 1866.

Lord Mayo was a popular and influential member of the Lower House, and he showed considerable capacity for public business in his administration of Irish affairs. He amply justified his nomination as viceroy of India in 1866, and proved himself an able and popular governor-general. It fell to his lot to encourage the development of the railway and telegraph systems, and to preside at the opening of those very lines to which Lord Dalhousie looked forward so earnestly and so confidently as the material guarantees of our dominion in Asia; and in the encouragement of education and of commercial and mining enterprise he could not well be surpassed. He was assassinated by a Mohammedan convict at Port Blair, in the Andaman Islands—where he had proceeded on a tour of official inspection—on 8th February, 1872. A sum of £20,000, and an annuity of £1000 per annum, was granted by Parliament to his widow for the benefit of herself and her family. ("Life of Earl Mayo," by W. W. Hunter, B.A., 1875.)

**MAYOR.** See MUNICIPAL CORPORATIONS.

**MAZARIN, JULES, CARDINAL**, Prime Minister of France in succession to Richelieu, was an Italian. His real name was Giulio Mazzarino. He was born at Rome in 1602, studied in Spain at Alcalá and Salamanca, entered the papal army in 1622, and showed his ability in the negotiations leading to the peace of Monçon, 1626. He was invited to become secretary to the Cardinal Sacerchetti, and in this office was largely concerned in effecting a peace between the French and Spaniards (treaty of Cherasco, 1631), during the preliminaries of which he became acquainted with Louis XIII. of France, and with Cardinal Richelieu and Barberini. The latter took a great fancy to the astute young diplomatist, and presented him to the Pope. A brilliant success in 1632 as legate at Avignon (the papal territory in France) was followed by his nomination as nuncio-extraordinary to Paris, November, 1634. He became a naturalized French subject in 1639, and was sent ambassador to Savoy by Richelieu in 1640, where he achieved such great results for France that the all-powerful minister requested a cardinal's hat for him, and began to look to him as his probable successor. When Richelieu followed to the grave, in 1642, Maria de' Medici, the queen-mother whom he had (perhaps deservedly) driven from France to die almost in indigence at Cologne, the feeble

Louis XIII. looked to Mazarin as the only possible successor to his late master-subject. The king himself died the next year, and Mazarin found himself named as one of the council of regency of the boy-king Louis XIV., then five years old. He at once threw himself into the party of the queen-mother, Anne of Austria, aided her to induce the *parlement* of Paris to annul the council in favour of herself as regent, and was rewarded by being chosen as the queen's prime minister. Henceforward, and until his death in 1661, Mazarin was practically king of France, except during 1651 and 1652.

Mazarin's reign of power opened brilliantly with the victories of the great Condé—Rocroi, Fribourg, Nordlingen, and Sens. Austria, quite beaten, hastily agreed to the peace of Münster or of Westphalia in 1648, and the blood-stained epoch of the Thirty Years' War had closed. Spain alone continued the contest. Perhaps Mazarin allowed his triumph to show too manifestly. He had a wonderful suppleness and mastery of intrigue, and veiled under a mask of quiet humility as autocratic views as those of Richelieu. The veil being partly withdrawn, and the aristocracy being no longer awed by the wonderful mastery of their late tyrant, they rose against his successor, whose modes of action they despised, and whose real genius they misunderstood and vastly underrated. France split into Mazarins and Frondeurs (malcontents), and Matthieu Molé, the judicious president of the Frondeur *parlement* of Paris, endeavoured in vain to quiet the rapidly growing storm. At last the queen, supported by Condé and his troops, released by the peace, withdrew to St. Germain and raised her standard. The troops advanced on the capital. The *parlement* and the Frondeur nobles raised troops on their side and began the War of the Fronde with an edict declaring Mazarin a public enemy, and ordering him to quit France within eight days (January, 1649). A temporary peace was patched up in March. Condé now began to waver in his loyalty: the cardinal thought he saw his opportunity, arrested Condé, and also the great Frondeur chiefs, the Prince de Conti and Duc de Longueville, January, 1650. But he quickly found that the great mass of the people was against him, and the royal cause failing on every side. The wily Italian bent to the storm, himself released the princes, and went into exile to Brühl, in the territory of the Elector of Cologne, whence he still directed the counsels of the queen in a most masterly and crafty manner (March, 1651).

As he foresaw, the Fronde soon fell asunder of itself, through the violent animosities and jealousies of its turbulent chiefs. Finally Condé took up arms on his own account against the queen. This brought about a rush of loyal feeling, and Mazarin was at once recalled by Anne of Austria (January, 1652). He returned in triumph, and with an army of 7000 or 8000 men. The queen had acted too quickly. Again the cardinal had to retire, in August, 1652; not to return till February, 1653, but this time he returned for good.

It was at this time that Cromwell, just declared Lord Protector of England, approached Mazarin with the view of withdrawing the French support from the English princes Charles and James, sons of the late King Charles I. This he obtained at the price of lending France a fleet and 6000 soldiers against Spain. Philip IV. had to own he was vanquished, the peace of the Pyrenees was signed in the midst of the river Bidasson, 7th November, 1659, the Spanish princess, Maria Theresa (of the house of Austria), was married to the young king Louis XIV., and the latter renounced all French claims that might thence accrue thereafter upon the crown of Spain, a false promise, whose breach later on led to the wars of the Spanish Succession.

This was Mazarin's last and greatest achievement. Absolute master of the kingdom, possessor of a colossal fortune, which some authors allege amounted to 50,000,000 livres (worth in money of the present day about £4,000,000), he

lived but a short time longer, dying at Vincennes, 9th March, 1661. Shortly before his death he handed to the king a deed of gift of his whole property. Louis nobly accepted it and returned it, as the arch-intriguer expected. Thus confirmed in his ill-gotten wealth, he could safely provide brilliantly for his five nieces, the ladies Mancini, with one of whom (Maria Mancini) the king had been desperately in love, and whom he would have married if the wiser cardinal had not himself pushed aside the perilous honour. Mazarin had been more successful with his own fortune than with that of the state. He left France very crippled in her resources, but absolutely at the feet of an absolute monarchy. The genius of Colbert restored order to the finances, and that of Louis XIV. knew how to make an autocratic despotism splendidly brilliant—for a time. Mazarin, by the systematic union of grinding taxation with a costly irresponsible government, was certainly one of the founders of the great French Revolution of a century and a quarter later. The queen-dowager survived her faithful friend and minister by five years, dying in 1666. It has always been one of the great puzzles of history to know whether or not Mazarin was actually married to the queen. There is a large body of conjectural evidence on the point which certainly appears to have weight.

Mazarin's letters were published in 1745; and his figure fills the well-known brilliant memoirs which at that time it was happily the fashion to write. De Retz, his great rival, La Rochefoucauld, Grammont, and others are the sources, as full of wit as of scandal, whence one learns to admire and despise this wily Italian chief of intriguers.

**MAZEPPA, IVAN STEPHANOVICH**, Hetman (that is, commander-in-chief) of the Cossacks of the Ukraine, has become celebrated by a poem of Lord Byron, which has for its subject the legend of his extraordinary adventure. He was the son of a Polish gentleman in Podolia. The famous story of his arrival among the Cossacks on the back of a wild horse, to which he had been bound by the husband of a woman whom he had seduced, has, however, been superseded by the contemporary memoirs of Paszek, which state that he retired among the Cossacks overwhelmed with shame at his exposure in his native land. He was born about 1640 in Podolia, was educated at court, and had been page to John Casimir, king of Poland. His military talent as displayed at the head of the Cossacks obtained for him the title of Hetman. His submission to the Czar of Moscow, and his secret league with Charles XII. of Sweden, are matters of history. He died in Turkey, whither he had retreated after the battle of Pultowa, about 1709.

**MAZURKA**, a national Polish dance. Originally it was a song accompanying dancing. About the middle of the eighteenth century the dance spread into Germany, and after another century reached England, where for a time it was very popular. Its music is always in triple time, usually 3-4, and in sections of eight bars, each section generally repeated. The dance itself is rarely danced purely out of Poland, for the dancers are limited to four couples (or sometimes eight), and the figures are not only very variable, but fresh ones are frequently developed extempore by skilful dancers as the dance progresses.

The dance, even the modified form to which it was degraded to suit English tastes, is now almost extinct in this country; one of its steps alone surviving in the "Polka Mazurka," but the music as a "dance-form" has been rendered immortal by Chopin. His mazurkas are even more fascinating than his waltzes. He wove old Polish airs into them, and while preserving the studied simplicity appropriate to the style, he enriched them with subtle harmonies and every refinement of grace and expression. More perfect musical gems have never yet been set.

**MAZZINI, JOSEPH**, or, to give him his Italian name, *Giuseppe*, was born at Genoa, 22nd June, 1805, where his father was a physician of note and of good private means.

An only son, his early education was conducted with great care and pains by his parents, who sent him to one of the public schools, and afterwards to the university of his native city. In youth he was noted for the warmth of his friendships, the strength and determination of his will, and the susceptibility of his feelings. As a youth he was intended for the legal profession; but the strong liberal opinions he had imbibed as a child, and his conviction that the oppressed condition of his country called for men of action and public spirit, and that a noble course lay open before any one who would give himself up, heart and soul, to the work of reforming her, led him to devote himself to a political career. His patriotic enthusiasm was fostered by his early studies, which developed in him a passionate idea of the glories of a republic, and by the success which he had achieved in literature while still little more than a youth. In 1827 appeared his maiden essay, "Dei l'Amor l'atrio di Dante," which was published in a liberal journal, the *Subalpino*.

About the year 1830 Mazzini was affiliated to the secret society of the Carbonari, and this was the introductory step to his subsequent political life; he was active, able, bold, and impetuous; and he soon rose into a position which gave him great influence in the councils of that body. At one time it appeared as if his career was likely to be cut short; for he was betrayed by a Piedmontese spy, arrested, and detained for six months as a prisoner in the fortress of Savona. He was set free at the end of that time only on condition of quitting Italy, and he came out of captivity to begin a life of "exile and apostleship," as he termed it, by founding the association of *La Giovina Italia*, and starting at the same time, and under the same title, at Marseilles, a monthly journal, the chief end and aim of which was the regeneration of Italy. It was about this time, too, that he addressed to Charles Albert a letter which drew on him a sentence of perpetual banishment from his native country.

Mazzini was the life, soul, and centre of this formidable league, which soon spread through the capitals of Europe a network of similar associations, each modified so as to suit the requirements of the several nations. Mazzini found himself speedily banished from Marseilles, and for several months he was forced to live in concealment. Still the "*Giovina Italia*" was not without its effects. Its first fruit was a revolutionary expedition into Savoy, which was organized at Geneva, but defeated by the royal troops. For his own ascertained share in the affair Mazzini was sentenced to death in the Sardinian courts. His "*Young Italy*" having been suppressed—at all events for a time—he now founded in Switzerland another association, which he called "*New Europe*," based on the principles of European rights and the widest enfranchisement of the people. In 1837 he quitted Switzerland, and took up his abode in London, which subsequently, for many a long year, he made for the most part his headquarters of operations in the Italian cause. He took, it is almost needless to say, a very prominent part in the great European crisis of 1848—a crisis which, no doubt, he helped as largely as any other man to bring about. In February, 1849, he was elected a member of the Tuscan provisional government, and in the following month he was chosen one of the Triumvirate of Rome amid the rejoicings of Italy. He was the mainspring of the defence of Rome against the French; and on the surrender of that city Mazzini quitted Italy and took up his abode at Lausanne, in Switzerland.

At this period he made his name famous in France by addressing to M. de Tocqueville and other French statesmen some most bitter and reproachful letters on the high-handed policy pursued in that country; and finding his continental residence too hot to hold him, he returned to London, not, however, with any idea of abandoning his long-cherished hopes for Italian unity. It was at his

instigation that the insurrections at Milan in 1853 and in Piedmont some three or four years later were attempted. In 1850, while lending the whole weight of his influence to the revolutionary movements in Italy, he opposed with vigilance and foresight the threatened predominance of France in the south of Europe, and refused to place faith in the liberal programme of the French emperor. The Sicilian expedition of 1860 owed, perhaps, as much to the subtle prudence and secret organization of Mazzini as to the personal heroism of Garibaldi.

In the later years of his life Mazzini's health was such as to help to keep him in comparative seclusion, although he still contrived to exercise a considerable, though silent, influence on the affairs of the Continent. Once, at least, he was elected by Messina as its representative; but he declined or neglected to take his seat, and his election, consequently, was declared informal. He died at Pisa, 10th March, 1872. In 1882 a monument to him was erected in his native city of Genoa.

Mazzini was a copious writer. The list of his works fills nearly ten pages of the catalogue of the British Museum. A perfect master not only of Italian, but of French and of English literature, he became early a commentator upon Dante, the author of works on philosophy, and a constant contributor to some of the most thoughtful periodical literature in Paris and in London. He could spare time from his philosophic study to provide for the relief and education of the poor Italian organ-boys who wander about the streets of London; and he would turn from the warfare of politics to write in his *Apostolato Popolare*, for the benefit of Italian workmen, sermons "On the Duties of Man." There is no more masterly analysis of the faults and shortcomings of the economic and socialist schools than that which he contributed to the columns of the *People's Journal*, or any more profound criticism on Thomas Carlyle's writings than that which proceeded from his pen in the *Westminster Review*.

Mazzini was one of the rare instances of men whom no reverses of fortune make less powerful. No amount of disaster ever shook his companions' confidence. No man of all he must have trusted ever betrayed him. He passed through countries where to be discovered was to die, through armies of spies and police and political enemies, like a spirit clothed with the old gift of invisibility to mortal eyes. This influence, rising in some cases to an ascendancy such as has hardly been given to the greatest religious teachers, was employed unswervingly for his single end, and it was employed successfully.

**MEAD**, a beverage made of water and honey by fermentation. It has been in use from ancient times, and is mentioned by Pliny, who says it has all the bad qualities of wine and none of the good ones. It is, however, a very luscious and palatable liquor.

**MEADOW LARK** (*Sturnella magna*) is a common American passerine bird belonging to the family Icteridae. This bird is common in the eastern United States, passing the winter in the south, and migrating northwards to breed. The meadow lark has a thick, stout body, with stout legs and a long bill. The plumage above is dark brown, each feather having the margin yellowish and a bay-tinted terminal spot; the wings and tail are barred with dark brown; the under surface is rich yellow; across the front of the breast is a crescent-shaped, deep, black band. The meadow lark in its habits somewhat resembles the European starling, collecting in flocks, except during the breeding season, and feeding on insects and their larvæ and seeds. The nest is made of grasses in a hollow of the ground, and covered over like an oven; the eggs, four or five in number, are white, with reddish-brown spots at the large end. During autumn and winter these birds become very fat, and as they are easily shot, are brought to market in great numbers, being much esteemed as food.

**MEADOW SAFFRON.** See *COLCHICUM*.

**MEADOWS** are properly low grounds on the banks of rivers, which, being kept moist by their situation, and also occasionally flooded by the rise of the waters, are best adapted for the growth of grass, and are generally mown for hay. Some meadows of great extent, belonging to a community or district, in which every inhabitant has a right to send his cattle to graze under certain regulations, are never mown.

When meadows are private property they become much more valuable. The flooding is encouraged or prevented according to circumstances, and in many cases artificial irrigation is adopted. [See *IRRIGATION*.] If they are exposed to be too often inundated, they are protected by dams and sluices.

The herbage of low wet meadows is generally coarser and less nutritious than that of those which lie higher; hence upland hay, as it is called, is preferred for the better sort of cattle. Upland meadows are very valuable wherever there is a demand for good hay. Not being annually recruited by flooding, they would degenerate if some pains were not taken to keep up their natural fertility. This may be done in various ways; the most obvious is to recruit them frequently with the richest animal and vegetable manure, which, being spread over the surface at a time when showers are abundant, that is, either early in spring or immediately after midsummer, is washed down to the roots of the grass. A meadow the soil of which is naturally of a rich nature, and adapted to produce fine grasses, may be mown year after year without any perceptible change in the quality of the hay; but meadows of inferior quality require to be occasionally cropped close, to check the growth of the coarser grasses, and to allow the finer to rise.

When a natural meadow has been neglected, and the grass is of an inferior quality, and mixed with rank weeds and moss, it requires much care to restore it to its original fertility. In most cases the shortest method and the best is to plough it up, clean and manure it during a course of tillage, and then to lay it down again in a clean and enriched state, by sowing the best sort of grass seeds.

It must be observed that it is not a matter of indifference what cattle are turned into the meadow after haying. Horses invariably produce coarse weeds by their dung and urine; cows may be depastured in autumn, as long as the surface is dry; but sheep are far more advantageous, and may be kept in the meadows at all times, if they are not too wet for the health of the sheep, and if there is no danger of their having the rot. As soon as the surface becomes soft by the autumnal rains cattle should be excluded.

**MEALS.** The time and manner of the chief meals has varied greatly at different times and in different countries. The ancient Egyptians appear to have taken their principal meal at noon, and this custom is maintained by their modern descendants, who dine directly after mid-day, and if possible indulge in a siesta afterwards. The ancient Jews appear to have followed the custom of the Bedonins, and while they had light meals in the morning and at noon, to have made their principal meal after sunset. The Greeks and Romans of the classic ages indulged in three meals a day, the first being taken immediately after rising in the morning, the second about mid-day, and the third, which was the principal meal, in the evening. In mediæval and modern Europe the prevailing practice, down nearly to the middle of the last century, was to have three meals a day, that taken at mid-day being the principal one. In our own country, we know from Chaucer that men breakfasted substantially on ale and meat at five, dined at nine, and supped at four. In the following century hours grew later, and by the sixteenth century breakfast was as late as seven, dinner eleven, supper six. By the beginning of the seven-

teenth century dinner was at noon, and the hour gradually got later and later, until it reached the present usage of from six to eight in the evening among persons of the upper classes, though the majority of the nation still dine at mid-day. In France and Italy the fashionable dinner hour is earlier than in England, and in Germany the usage still obtains to a large extent of an early dinner and supper.

**MEAL-TUB PLOT,** a pretended plot against Earl Shaftesbury and others, invented by one Dangerfield, when the more celebrated Popish Plot of Titus Oates was lagging fire, to stimulate the waning hatred against the Roman Catholics. It seems likely that Shaftesbury knew of the falsity of the plot, so calculated to serve his political aims. James, duke of York, was directly accused by Dangerfield in 1679 as privy to the plot. The papers relating to it were supposed to have been discovered concealed in a meal-tub of a certain Mrs. Collier. Gigantic torch-light processions paraded the streets of London, and the effigy of the Pope was burnt amid the cries of the enraged people.

When the Roman Catholic James became king at the death of his brother in 1685, he at once had Oates and Dangerfield arrested. The latter was arrested, not on the dangerous subject of the plot, but formally on a charge of libel upon the late as well as the present king, uttered at the time of the agitation for the Exclusion Bill (a measure which would, if passed, have excluded James from the throne). At his trial before the Privy Council, however, his conduct in the discovery of the Meal-tub Plot was investigated, and Dangerfield confessed that it was all an invention of his own. He was pilloried and whipped from Aldgate to Newgate, and Newgate to Tyburn. He died of this torture as he was carried into Newgate on his return, 31st May, 1685.

**MEAL-WORM** is the name of the larva of a beetle (*Tenebrio molitor*) belonging to the family Tenebrionidae, of the section Heteromera. The perfect insect, which is about two-thirds of an inch in length, is common in England in the neighbourhood of granaries, flour-mills, and other places where meal or flour is stored up. The larva, the meal-worm, is about an inch long, cylindrical, smooth and glossy, of an ochreous colour. It is very destructive in all its stages to flour and meal. Ship biscuits packed in casks are often pierced through with holes made by these larvæ. Meal-worms form a favourite food for caged nightingales.

**MEALY BUG.** See *COCCIDÆ*.

**MEAN** (from the Old French *meien*, now *moyen*, which came from the Latin *medianus*, *medius*, middle). By the mean of two or more quantities is meant an intermediate quantity determined by mathematical rules. There are more ways than one of finding a mean, but the two principal results of this kind are called the *arithmetical mean* and the *geometrical mean*. The names are not properly expressive of the distinction between them, but they are established by use. An arithmetical mean is the simple *average*, formed by adding the quantities together, and dividing by the number of quantities. A geometrical mean is the square root of the product of the quantities.

The arithmetical mean or average (which is always to be understood when the word mean is mentioned, unless the contrary be specified) is taken to be the most probable result of a number of discordant quantities which would have been the same but for errors of observation or experiment, or the middle point to which a number of quantities approximate, some going as much beyond it as others fall short of it.

**MEASLES** (known also as *Morbili* and *Rubeola*) is the name commonly given to an infectious specific fever, attended with an eruption on the skin, the origin of which is unknown, but which at present is always derived from contagion. The contagium of measles does not seem to be

conveyed by the air, except in the catarrhal stage of the disease, but it clings to surfaces, and may be readily carried by the clothing from place to place. After infection the disease passes through a period of incubation, which lasts from ten to twelve days, or even a day or two longer, before the characteristic rash appears. The appearance of the rash, however, is preceded by certain well-defined symptoms, of which the more important are lassitude and a feeling of chill, followed by hot and feverish sensations, and all the signs of a common cold. There is a running at the nose, sneezing, watering and redness of the eyes, headache, drowsiness, and a hoarse and ringing cough, attended with difficulty of breathing. These symptoms usually last three days, on the third day generally increasing somewhat in severity, and a few spots of eruption then become visible on the forehead and sides of the face, from whence they gradually spread over the cheeks, and from the face downwards over the rest of the body, the arms and legs being the last to be involved. The rash consists of rose-coloured spots, nearly circular in shape, which are raised a little above the surface of the skin, and which often cluster together in crescentic patches, which coalesce into masses of irregular outline on the body. The spots individually appear and fade in about twenty-four hours, and the eruption as a whole continues for about four days, by the end of which it should have disappeared. As the eruption subsides the other symptoms subside also, the feverishness disappears, and in a favourable case the patient at the end of a week from the commencement of the symptoms of cold, is left somewhat weak, but in a state of convalescence. While the foregoing may be taken as an account of an ordinary attack of the disease, it often happens that special symptoms appear of a painful or dangerous character. Thus the eyelids may become swollen and the eyes inflamed and intolerant of light; the face itself may swell considerably; there may be sore throat and a swelling of the glands of the neck; the hearing may be affected owing to the swelling of the pharynx extending to the Eustachian orifices; the temperature may rise to an abnormal height, and there may be nocturnal delirium.

With respect to the treatment of this disease no antidote to the poison of measles is known, and the complaint must be allowed to run its course when once the infection has been received. The chief thing to do is to place the patient under such favourable circumstances as to allow him every chance of recovery, and to guard him from the danger of complications. The chief requisites in the treatment of measles are rest, fresh air, warmth, diluents, and light, nourishing, easily digested food. As soon as the first signs of cold appear the patient should be isolated from others, and confined to a warm well-ventilated room; when the signs of fever appear it is best for him to remain in bed. The light should be partially excluded where the eyes are sensitive and weak, the thirst may be quenched by the use of barley water, lemonade, or toast and water, and the irritation of the skin may be allayed by careful sponging with tepid water, or the use of cold cream to the face and carbolic oil to the body.

The disease where it runs an uncomplicated course is seldom fatal, and in healthy houses the proportion of deaths to attacks is not more than 1 or 2 per cent. The dangers chiefly to be feared are that inflammation of the air passages (bronchitis) should be established, or that inflammation of the lung-tissue itself (pneumonia) should appear. The chief mortality of measles is caused by lung disease, though sometimes the bowels are affected, and death may ensue from the weakness caused by obstinate diarrhoea. The decline of measles may also leave an impairment of the general health, and a child that has recovered from this complaint may be left specially liable to pulmonary disease. It will be seen from this that care and attention are always necessary notwithstanding the

apparently trivial nature of the complaint, and when recovery has taken place every care should be used to protect the patient from the dangers involved in taking cold. It has been found that bad air and unsanitary surroundings increase largely the death-rate from measles, which sometimes rises under these circumstances as high as 80 per cent. The average mortality is usually reckoned as about one in fifteen. Although children are chiefly affected the complaint is not confined to them, and it may attack adults at any period of life. One attack as a rule procures exemption from the disease, and though persons are occasionally attacked twice by the measles, such cases are of very rare occurrence. An allied form of rubella, known as *rubella sine catarrho* or *rubella*, however, is often mistaken for a second attack of measles. In this, however, the rash appears during the first day of illness, it subsides with the fever on the third day; it is not preceded by catarrh, and it has no power to protect against an attack of true measles.

Measles may be distinguished from scarlet fever or scarlatina by the fact that the former commences with the symptoms of a common cold, but the latter does not. In measles the rash appears on the third day of the fever, in scarlatina on the second: the rash in measles is in patches of a crescentic or half-moon shape, the spots, which resemble flea-bites, being raised above the skin; in scarlet fever the eruption is not raised above the skin, it is universally diffused, and the spots are of a bright scarlet colour. In measles the chest is chiefly affected; in scarlet fever the tonsils are enlarged and the suffering is felt chiefly in the throat. In scarlet fever if the finger-nail be drawn firmly across the redness of the skin, a white streak is left which remains for one or two minutes before it disappears, and if the skin is steadily pressed it assumes a yellowish tint; but these signs are absent in an attack of measles.

**MEASURE.** One number or magnitude is said to measure another when the first is contained an exact number of times in the second. The number need not be integral, but may be fractional. Other quantities are said to be incommensurables. [See COMMON MEASURE, PROPORTION.] It is found useful to have standard measures of time, space, and mass. These are in England the SECOND, the YARD (for which usually the FOOT, its third part, is substituted), and the POUND; and in France the second, the metre, and the gramme. Velocity is measured in feet per second; force in foot-pounds (so many pounds raised one foot), and all other measures, in like manner, are found ultimately to rest upon these three. They are fully described under their special articles; and all the principal WEIGHTS AND MEASURES are collected and tabulated in the article of that name. See also PINT, LITRE, SPECIFIC GRAVITY, THERMOMETER, JOULE'S EQUIVALENT, VOLT, OHM, COULOMB, AMPERE, for important measures of various magnitudes.

**MEATH**, formerly distinguished as *East Meath*, a county in the province of Leinster, in Ireland, is bounded N. by Monaghan, N.E. by Louth, E. by the Irish Sea, S.E. by Dublin, S. by Kildare, S.W. by King's County, W. by Westmeath, and N.W. by Cavan. Its form is very irregular. Its greatest length E. to W. is 47 miles; its greatest breadth N. to S. is 40 miles. The area is 904 square miles, or 578,247 acres. The population in 1881 was 87,469.

*Surface, Coast-line, Geological Character.*—The coast has a tolerably straight outline running south by east from the mouth of the Boyne to the boundary of the county of Dublin near Gormanstown. The shore is low, skirted by sandbanks or hills, and broken by one or two small streams which flow into the sea. The county has altogether only about 10 miles of coast, and no harbour of importance. The climate is comparatively dry and cold. The surface is mostly level or undulating, rising towards the west and north-west.

The county of Meath is for the most part included in the great central carboniferous limestone district of Ireland; the whole of the southern part of the county, and considerable portions of the north and west, are occupied by this formation. A small tract is occupied by the rocks of the limestone formation, and by a small coal-field, the beds of which, however, are found to be not worth working.

The county belongs almost entirely to the basin of the Boyne; a small portion in the northern part belongs to that of the Dee, the heights about Slane separating the two. The southern and south-easterly borders are watered by the affluents of the Liffey, or by some smaller streams which flow into the sea between the Liffey and the Boyne. The chief affluents of the Boyne are the Blackwater, Menagh, Blind, and Deel. The Boyne flows into the sea near Drogheda. The Nobhor is the chief tributary of the Dee. There are several small lakes. Lough Sheelin, which separates the counties of Meath and Westmeath from that of Cavan, is of an oval form, 5 miles long and about 2½ miles broad. It contains a small islet called Church Island, with the ruins of an old church on it. Lough Bawn, 1½ mile long, but very narrow, and some smaller lakes, lie on the western border of the county. The Lake of Kilmainham, formed by an expansion of the river Nobhor, is about a mile long and above a quarter of a mile broad. Bogs are numerous, but the aggregate of their extent is small: the largest is on the border of the county south-west of Athboy.

About 14 miles of the Royal Canal pass through this county, giving access to Dublin and to the Shannon. Meath is also well provided with roads, and is traversed by the Dublin and Drogheda and the Midland Great Western railways.

*Agriculture and Productions.*—This county has very few mountain wastes. The land is level and pasturage rich. The soil is for the most part a loam of the richest character, and in many places of such depth that the turning up of a fresh portion of the soil, by ploughing deeper than usual, is considered as an efficient substitute for manuring. The whole quantity of land devoted to green crops is small, in consequence of the abundance of the natural pastures, which are of unequalled richness, and have led the farmers to give their chief attention to grazing. Of the corn crops oats has by far the largest acreage.

The quantity of cattle fattened in the pastures of the county is considerable, and the breeds are of superior kinds. The grazing is carried on on a large scale. The horses are generally of an inferior kind. The pigs are of a good breed. Poultry is abundant. The occupations of the inhabitants are almost exclusively agricultural, but some coarse linens are manufactured. Meath is divided into eighteen baronies, and contains 146 parishes. It returns two members to the House of Commons. The county town is Trim.

*History and Antiquities.*—At an early period Meath constituted one of the kingdoms into which Ireland was divided. Teamor, now Tara Hill, near the Boyne, was the residence of the sovereign of Ireland, the seat of the supreme government, and the place where St. Patrick made his first efforts for the conversion of the Irish to Christianity. The kings of Meath became afterwards tributaries to the kings of Ireland. In the invasions of the Northmen or Danes, the kingdom of Meath suffered severely. Before the invasion of Ireland by Henry II., Dermot MacMurrough, king of Leinster, had reduced O'Melaghlin, king of Meath, and other princes, into a state of subjection; but a quarrel between some of these chiefs led to an invitation by one of them to the English to enter Ireland; and the result was that Richard Strongbow took possession of Meath in 1171, which was conferred by Henry II. as a county palatine on Hugh de Lacy, who was appointed governor of the English pale or district.

For a century and a half Meath was a scene of conflict, sometimes between the English and the Irish, and sometimes

between the king and the powerful barons. The English dominion, never fully established, appears rather to have decayed during the reigns of the later Plantagenet and the Lancastrian princes, and the Civil War of the Roses. In the reign of Henry VIII. the power of the English began to revive, when the ancient county of Meath was divided, and West Meath, including the present counties of Westmeath, Longford, and part of King's County, was formed into a separate county.

There are several remains of antiquity in the county. At Tara, once the seat of the Irish monarchs, are considerable earthworks. There are ruins of the castles of Scurlougstown, Dunmoe, Athlumley, and Asigh. Slane Castle and one or two others have been fitted up as residences. There are round towers at Kells, and at Donoughmore, near Navan. There are numerous ruins of ancient monastic edifices: those of the monastery at Duleek, supposed to be the most ancient monastic edifice built of stone and mortar in Ireland, present some remarkable traces of rude architecture. The front of the ancient cathedral at Clonard yet exists, and there are several stone crosses. The ruins of Bective Abbey are extensive and picturesque.

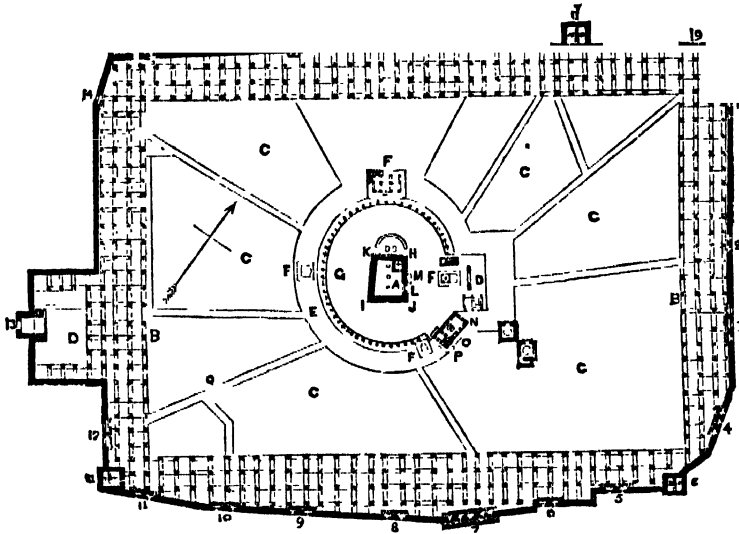
#### MEATH, WEST. See WESTMEATH.

**MEAUX**, a town of France, in the department of Seine-et-Marne, situated 25 miles by railway E.N.E. from Paris, on both sides of the Marne. It has civil and commercial tribunals, ecclesiastical and communal colleges, and 10,455 inhabitants. The town occupies the site of the ancient *Latinum*, afterwards called *Meldi*. The most remarkable events in its history are its eight months' siege and capture by the English under Henry V. (2nd March, 1421); the cruelties that followed the rise of French Protestantism, of which it was the cradle; and the repulse of the Russians in 1814, who, however, in a subsequent attempt made themselves masters of the town. Meaux is near the Ourcq Canal on the river Marne, which divides it into two unequal parts. It is pretty well but irregularly built. The Gothic cathedral of St. Etienne, consisting of a nave, transept, aisles, choir, and sanctuary, is considered a masterpiece, though externally unfinished, one tower only being completed. It was founded in the eleventh century, and contains a white marble monument erected by the department to the memory of Bossuet, of whom some memorials are still preserved in the bishop's palace. The other interesting objects at Meaux are a public library of 13,000 volumes, the town-hall, the market-house, the cavalry barracks, and two hospitals. Calicoes, cotton handkerchiefs, earthenware, glue, saltpetre, flour, and leather, are among the chief industrial products; there is also a considerable business carried on in corn, cheese, wool, cattle, and poultry. The corn and cheese markets are important. The old ramparts, which are planted on the banks of the Marne, afford very agreeable walks.

**MECCA** or **MEKKA**, the birthplace of Mohammed (571), and the holy city of the Mohammedans, is situated near the south-east extremity of the Hedjaz, the "land of pilgrimage," the long, thinly-peopled strip of Arabia which runs down from the north-west angle by the Red Sea, and intervenes between the sea and the Central Arabian desert, 50 miles from its frequented seaport of Jeddah. The ordinary population has been estimated at 45,000. The city lies in a basin about 1½ mile long, and about half that width, surrounded by steep hills, up the sides of which climb the houses in most irregular order; while the whole valley is crammed with buildings of all shapes and sizes, many of them of considerable height, built of roughly dressed or undressed stone and rubble; sometimes plastered, with flat roofs with no open space to be detected in any direction. In fact everything is built with systematic irregularity. In the centre stands out conspicuously the great square of the Haram or Prophet's Mosque, inclosing the CAABA.

The Moceráwf, or inhabitants of Mecca, with few exceptions, are Arabians from different countries; but they have amalgamated, and they wear the same sort of dress and have adopted the same customs. They are estimated to number altogether from 30,000 to 60,000. Except a few

potteries and dyeing-houses, the people of Mecca have not a single manufacture. During the Hadj or sacred pilgrimage, the town becomes one of the largest fairs in the East, and certainly the most interesting, from the variety of nations which frequent it. See HADJ.



Plan of the Prophet's Mosque, Mecca.

a b c d e, Minarets; 1 to 10, Baba or gates; A, Caaba; B R, Cloisters; C C, Gravel; D, Ba; I, Salem; K, Outer step; F F F F, Makam Hanzafy, north—Makam Hanzafy, west—Makam Hanzafy, south; M, Outer step; N, Outer step; O, Outer step; P, Outer step; Q, Outer step; R, Outer step; S, Outer step; T, Outer step; U, Outer step; V, Outer step; W, Outer step; X, Outer step; Y, Outer step; Z, Outer step.

**MECHANICAL EQUIVALENT OF HEAT.** See JOULE.

**MECHANICAL POWERS** is the name given to certain simple machines, in which one driving force or effort is made to produce motion against one resistance. As to the general principle of the action of machines, when only one driving force and one resistance are concerned, the effort and the resistance are to each other inversely as the velocities of their points of application, called respectively the driving point and the working point. The use of a machine is to enable an effort, acting through a given distance, to overcome either a resistance greater than the effort through a less distance, or a resistance less than the effort through a greater distance. The theoretical condition of there being but one effort and one resistance is never exactly realized; because in addition to the useful resistance there are always wasteful resistances, which render a greater effort necessary to drive the machine than if the useful resistance alone were to be overcome. In estimating efforts and resistances it is to be borne in mind that an effort acts directly with, and a resistance directly against, the motion of its point of application; so that when a force is applied to a point in a machine, in a direction oblique to the motion of that point, that force is to be resolved into a transverse component and a direct component, and the direct component alone taken into account. In many writings on the mechanical powers the resistance is called the weight and the effort the power. The mechanical powers are classed as follows:—

1. Simple machines, consisting of a body turning about an axis, and having a resistance opposing, and an effort promoting that motion, which forces bear to each other the

inverse ratio of their leverages, or perpendicular distances from the axis. This class comprehends the **LEVER**, and its modification, the **WHEEL AND AXLE**.

2. Simple machines in which the advance of a moving piece is promoted and opposed by a pair of forces, one or both of those forces being oblique to the direction of motion. This class comprehends the **WEDGE**, the **INCLINED PLANE**, and its modification, the **SCREW**.

3. Simple machines in which a body is pulled by two or more plies of one cord. This class comprehends the **PULLEY**. All of these are fully described in their several articles.

**MECHANICS** (Gr. *mēchanē*, machine, device) originally meant the art of contriving and making machines; then it was extended to the science of the action of machines; and it now comprehends the whole science of those relations of bodies to each other which consist in motions, and in tendencies to produce or to prevent motion, called forces. The science of mechanics, in its most comprehensive sense, is divided into two branches—dynamics containing kinematics (Gr. *kinēma*, motion), relating to the comparison of motions with each other; and dynamics proper (Gr. *dynamis*, power or force), relating to forces as well as to motions. The second branch of **STATICS** relates to balanced combinations of forces. Another mode of subdivision of mechanics into branches is founded on the condition, solid or fluid, of the bodies whose actions and motions are considered; and is indicated by the prefixes *stereo* (Gr. *stereos*, solid) and *hydro* (Gr. *huidōr*, water). The prefix *stereo* is used seldom, but *hydro* frequently, as in **HYDROSTATICS**, **HYDRODYNAMICS**, **HYDRAULICS** (the last term meaning properly the science



of the flow or conveyance of fluids, Gr. *aulôn*, channel). **PNEUMATICS** (Gr. *pneuma*, wind) means the mechanics of fluids in the gaseous state. See the articles indicated, and also **FORCE**, **MOTION**, **VIRTUAL VELOCITY**.

The leading events in the history of mechanics as a science are—the discovery of the principles of the equilibrium of parallel forces and of hydrostatics by Archimedes in the third century B.C.; the discovery of the principle of the inclined plane and the balance of oblique forces by Simon Stevin, an engineer of Bruges, and of the laws of accelerated and retarded motion by the great Galileo, both of whom flourished during the second half of the sixteenth and first half of the seventeenth centuries of the Christian era. Galileo further added the theory of falling bodies and of the pendulum, the laws of motion, now called the first and second laws of motion, and best known in the form in which Newton has put them in the "Principia," and the first sufficient theoretical explanation of the lever and screw (1592). His pupil Torricelli proved the important theorem, that if a system of bodies be so arranged that its centre of gravity can neither ascend nor descend it will remain at rest. The final completion of the principles of abstract mechanics, with the proof that they apply to the heavenly bodies as well as to those on earth, and the chief methods of treatment still adopted, are due to Newton, towards the end of the seventeenth century. Since the time of Newton no new fundamental law has been discovered in mechanics. In 1686 Leibnitz showed that the force of a moving body did not vary as the velocity, as had hitherto been taught, but as the square of the velocity. J. Bernoulli, with his doctrine of the conservation of living forces (*vires vivæ*), made the next great contribution; and finally, in 1688 Lagrange showed how to apply the methods of co-ordinates to mechanical problems, thus making the science purely analytical. Since then the art of applying mathematical principles to mechanical questions, and the introduction of mechanical principles into the theories of physical phenomena in general, have been rapidly and extensively developed.

**MECHANICS' INSTITUTE**, a species of educational club, originally established by Dr. Birkbeck, who in 1800 collected a number of the mechanics and engineers of Glasgow, and delivered before them a course of lectures on natural philosophy and other scientific subjects. In 1823 his idea was taken up by various noblemen and gentlemen in London, among whom should be named Lord Brougham, and the first institution of the kind, specially designed for working men, clerks, and artisans, was founded in Southampton Buildings, London. Similar establishments may now be met with in every town in the kingdom of any social or commercial importance. They are supported partly by the members' subscriptions and partly by contributions, and include a reading-room, a lending library, a lecture-room, and classes for the study of the arts and languages. Working men's clubs, recently introduced, are modifications of the old mechanics' institutes. They are intended to be self-supporting, to be entirely managed by working men, and to furnish numerous innocent opportunities of recreation to the jaded "children of toil."

**MECH'LIN.** See **MALINES**.

**MECKLENBURG**, a country in North Germany, lying between 53° 8' and 54° 2' N. lat., and between 10° 40' and 13° 45' E. lon., consisting of the grand-duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz, and the principality of Ratzeburg, is bounded N. by the Baltic, E. by Prussia, S. by Prussia and Hanover, and W. by Lauenburg and Lübeck.

The surface of Mecklenburg may be described generally as a plain; the soil is fertile, and the pasturage excellent; cattle are extensively reared, and cavalry horses are exported. The forests produce some excellent timber, and fish abound on the coast and in the lakes. Wheat, rye, barley, oats,

pease, and rapeseed are raised in large quantities for exportation—a great proportion of the barley being sent away in the shape of malt. There are large deposits of common and potassium salts at Lübbtheen. The climate is moist, but healthy and temperate, though the winters are often severe.

Agriculture is very flourishing over the whole country. A considerable part of the surface is covered with lakes; the largest of these, Müritz, is 18 miles long by 8 broad. The chief rivers are—the Warnow, which is about 100 miles long, and falls into the Baltic Sea at Warnemünde, below Rostock; the Recknitz, which falls into the Baltic further east; the Elde and the Sude, feeders of the Elbe, which touches the south-western boundary at two points.

The grand-ducal house of Mecklenburg is the only reigning family in Europe of Slavonic origin, and claims to be the oldest sovereign house in the western world. In their full title the grand-dukes style themselves Princes of the Vandals; and they trace their descent to Genseric, king of the Vandals, who died in 477, and whose offspring settled on the southern shores of the Baltic as rulers of Mecklenburg. One of their descendants, Burewin, obtained the hand of Matilda, daughter of Henry the Lion, and through the influence of the latter was enrolled among the princes of the Holy Roman Empire. They received the ducal title from the Emperor Charles IV. in 1340, and assumed that of Grand-duke by permission of the Congress of Vienna, in 1815. Previous to 1701, Mecklenburg-Schwerin and Mecklenburg-Strelitz formed but one state; at that date the separation of the latter took place, in favour of a younger son of the reigning duke.

**MECKLENBURG-SCHWERIN** comprises an area of 4834 square miles, and in 1881 had 577,055 inhabitants, the great majority of whom are Lutherans. Although the country is but thinly populated, emigration until 1875 (since which year there has been a large increase in population) carried off large numbers of the inhabitants. The predominating form of religion is the Lutheran.

In 1866 Mecklenburg-Schwerin was included in the North German Confederation, and now forms part of the Germanic Empire. Until recent times the government was a pure aristocratic despotism of the most exclusive character, but the Parliament of United Germany has done much to remove, or at least to lessen, the grievances under which the people have so long suffered, by instituting freedom of settlement, of work, and of the press, and by altering that part of the constitution which placed the whole legislature in the hands of the nobility, and conserved it as a privilege for that class alone. Schwerin is the capital.

**MECKLENBURG-STRELITZ** lies to the east of Mecklenburg-Schwerin, and covers an area of 997 English square miles. The country is flat and similar in its features to Mecklenburg-Schwerin; but owing to its being further from the sea the climate is less humid and changeable. The population in 1881 was 100,269.

The Congress of Vienna permitted Duke Charles Frederick of Mecklenburg-Strelitz to adopt the title of Grand-duke, notwithstanding the exceedingly limited extent of his territory. A territory of 7 square miles, with 10,000 inhabitants, which was added to the newly-created grand-duchy in 1815, was sold to Prussia, in 1819, for the sum of 1,000,000 thalers, or "100 thalers per soul." The capital is Neu-Strelitz.

**MECONIC ACID.** This acid is obtained from opium, the inspissated juice of the poppy (*Papaver somniferum*, natural order Papaveraceæ), in which it exists as meconate of morphia. It is extracted by precipitating the aqueous solution of opium by calcium chloride; the meconate of calcium so precipitated is decomposed by hydrochloric acid. It crystallizes in micaceous scales, containing three equivalents of water, and having the formula  $C_7H_4O_7 \cdot 3H_2O$ . It is soluble in water and alcohol, but not in ether. When heated to



120° C. (248° Fahr.), it is converted into comenic acid ( $C_6H_4O_2$ ) and carbonic acid. It forms three series of salts called meconates—monobasic, dibasic, and tribasic. The meconate of iron forms a deep blood-red liquid, which is characteristic. The meconate of morphia is used in medicine as a narcotic. There are three meconic ethers.

**MECONIN** or **OPIANYL**, a neutral substance obtained from opium. It may also be prepared from narcotine by oxidizing it with nitric acid, or from opianic acid by the action of alkalis. Meconin crystallizes in colourless hexagonal prisms having the formula  $C_{10}H_{10}O_4$ , and it melts at 90° C. (194° Fahr.), and at a higher temperature distills unchanged. It is very soluble in hot water, alcohol, and ether; also in potash and soda, but not in ammonia. With chlorine, bromine, and iodine it combines, forming chloromeconin ( $C_{10}H_9ClO_4$ ), bromomeconin ( $C_{10}H_9BrO_4$ ), and iodomeconin ( $C_{10}H_9IO_4$ ); with nitric acid it forms nitromeconin ( $C_{10}H_9NO_6$ ).

**MECONOPSIS** (Gr. *mekon*, a poppy, and *opsis*, a resemblance), a genus of plants belonging to the order **PAPAVERACEÆ**. The Welsh Poppy (*Meconopsis Cambrica*) is a native of England, Wales, and Ireland, but it is a rare plant. It is also found in many parts of Europe, and is an ornamental plant, with delicate sulphur-yellow flowers. It will grow in a rich light soil in a shady situation, and may be propagated by dividing the roots or by seeds. It differs from the true poppy in its short style and the five or six free stigmas.

**MEDAL** (Ital. *medaglia*). Numismatists have usually given the name of medals to those coins that have been struck or cast for particular purposes and on extraordinary occasions, in commemoration of victories, treaties, coronations, and similar important events, or in honour of remarkable persons, in distinction to those which have been issued and generally circulated as money. For the latter see the article **COIN**.

Greek medals and medallions, as distinguished from the exquisite Greek coinage, are very rare, few being known of earlier date than the establishment of the imperial power at Rome, and when Greece was under Roman dominion. Some of Sicily are not, however, so scarce; they are of very fine design and workmanship. Roman medals are more common. Many of great excellence and in high preservation are contained in the collection of coins in the British Museum. Many fine ancient medals of Rome are of large size, as large as a *denarius*, and these are called *medalliones*. Early medallions are rare, the finest being one of Augustus in gold. Besides medals commemorative of princes there are the curious **CONTORTIATE MEDALS**, which are described in a special article under that heading.

The earliest examples of modern medals and medallions seem to be of the fifteenth century, though there is one remarkable exception to this in a medal of David II., king of Scotland. It is of gold, and was probably executed during that prince's captivity in England, sometime between the years 1380 and 1370. From the fifteenth century there is a succession of medals in most European countries. A gold medal of the Council of Florence, dated 1439, is one of the earliest. A still earlier one, if the date 1415 is correct, is of John Huss; but some doubts have been entertained of its authenticity. Vittore Pisano, of Verona, is celebrated as the great restorer of the art. Pisano's medals are very large and are all cast. They are usually inscribed "Opus Pisani Pictoris." It is curious that he should always refer to his being a painter while exercising a totally distinct branch of art. The papal medals commence properly with Paul II., who began to reign in 1464; those of pontiffs who lived prior to that date having been added to the collection by successors. As some of the papal medals are due to Raffaele and such artists, and to the graver of Cellini, they are very lovely. The German medals commence in 1453, and are very

numerous. The post-classical Sicilian medals appear as early as 1501. The Spanish medals begin in 1503. The earliest of Venice appear in 1509; and those of Denmark in 1516. The first Dutch medals seem to be of 1666, and they are remarkable for the elaborate views, maps, and plans that are engraved on many of them.

The French medals do not exhibit any remarkable excellence till the reign of Louis XIV. gave an impulse to the art, and we find his entire life illustrated by medals; some of them are well designed and finely executed. The medallic history of Napoleon also deserves notice in the series of medals of France. It is of great extent, and is for the most part honourable to French art.

The series of English coins and medals is one of the most perfect. The first medal is of 1480. It is of a large size, and executed in the early Italian manner. On one side is a portrait with **IO. KENDAL RHODI TURCOPOLITARIUS**; on the reverse the arms of Kendal, with the inscription, **TEMPORORUM ORDINIS TURCORUM, MCCCCLXXX**. The next English medal is of the time of Henry VIII. It is of gold, and bears the king's portrait on one side, with an inscription on the reverse. The first coronation medal appears in the reign of Edward VI. The medals of Queen Mary are numerous, and very interesting from the devices they bear. The Scotch coronation medal of Charles I. is of gold, and was struck at Edinburgh. It is remarkable as being the first struck in Britain with a legend on the edge. There is a fine series of city medals belonging to London, but not of any great antiquity, issued to members of the corporation on all great occasions. The use of the *war medal* in the army and navy as an honourable memento of having served in the campaign commemorated by it deserves mention, although from the point of view of art they are usually not very valuable. They are generally issued to the entire force. The Peninsula and Waterloo medals, the Crimea and India medals, and the Egypt medal are among the most honourable. The best introductory handbook on the subject is a fine series of essays by the officers of the Coin Department of the British Museum, edited by Mr. Stauley Lane Poole, entitled "Coins and Medals, their place in History and Art" (London, 1885).

**MEDAL LION**, in architecture, is any circular or oval tablet bearing on it objects represented in relief, as figures, heads, animals, flowers, &c. It is also a name given to a medal of unusually large size. See **MEDAL**.

**MÉDARD, ST.**, is the French analogue of St. Swithin. Across the Channel the jingle runs—

"S'il pleut le jour de St. Médard  
Il pleut quarante jours plus tard."  
(If on St. Médard's day rain drops  
'Tis forty days before it stops.)

St. Médard earned his title of "Master of the Rain" from a miracle which happened to him when in a large company whom the rain wetted to the skin: he was found quite dry. It was found that an eagle had flown all the time above him and protected him with outspread wings. St. Médard's Day is the 8th of June; and he has a closely formidable rival in St. Gervais, who holds the 19th of June for his festival, though the distich relating to the latter is in less favour—

"S'il pleut le jour de St. Gervais  
Il pleut quaiante jours après."

(St. Swithin's Day is the 15th July.)

**MEDE'A**, or more properly **MEDEA**, in Greek mythology, a daughter of Aïetês, king of Kolchis, wedded Jason the Argonaut, and by her knowledge of magic assisted him to obtain the great prize of the Golden Fleece. [See **ARGONAUTS**.] She then fled with Jason in the Argo, but as her father discovered the flight and set sail after them, she killed and cut in pieces her young brother Absurtos, whom she had taken with her, and casting the limbs on every side, saw her afflicted father piously stop to

gather them up, while the *Argo* sailed successfully away. Thus they reached Iolkos in safety, and Jason ruled over that state and Corinth peacefully with Medea for ten years. But being then deserted by Jason for the sake of Kriusa or Glaukê, the daughter of Krôn, king of Argos, Medea murdered her two children by Jason, poisoned the unfortunate Glaukê, and then fled from the land in a chariot which was drawn by dragons. She lived for a time with Aigeus, king of Athens, but eventually returned to Kolchia.

**MEDES, MEDIA.** The early history of the Medes, like that of many other nations, is involved in the deepest obscurity, and though according to Berosus they conquered Babylon 2458 B.C. and reigned over it for 224 years, being afterwards subdued by the Assyrians, the first mention of them in the cuneiform inscriptions occurs about 880 B.C. At that period they consisted of a number of petty tribes, each ruled by its chief, inhabiting a portion of that region which bore their name down to the Mohammedan conquest of Persia. In the seventh century B.C. they became consolidated into a single kingdom by some means at present unknown, and under their king Cyaxares they captured Nineveh about 625 B.C., and effected the conquest of the whole of Assyria. Of all the ancient Oriental monarchies the Median was the shortest in duration. It commenced in the seventh century, and it was brought to an end 558 B.C. by the conquest of the Medes by Cyrus at the head of the Persians. There was a close race-relationship between the two peoples, as they had the same early traditions, the same language, and nearly the same religion, and after one or two unsuccessful attempts at revolt we find the Medes became absorbed into the Persians. In character the Medes appear to have been a brave warlike people, excellent horsemen, and famous for their skill with the bow. Their language was a cognate of Zend, and their religion originally seems to have been that simple creed which may be gathered from the earliest portions of the *Zendavesta*. At a later period they came into contact with the fire worshippers of Armenia, and their own system became amalgamated with that of Magism.

The Median kingdom at the height of its power was bounded from N. to S. by the Euphrates and the Persian Gulf on the one side and by the Black Sea and the Caspian Sea on the other. E. to W. it extended from the Halys as far as the Caspian Gates, and possibly further. It thus embraced all Persia, Assyria, Armenia, and Cappadocia, with a total area of 600,000 square miles. Media itself was bounded N. and N.E. by the Caspian, E. and S.E. by the great salt desert of Iram, S. by Persia, W. by Assyria, and N.W. by Armenia. Its greatest length was from north to south, and in this direction it extended to a distance of about 550 miles. Its average breadth was not more than from 250 to 300 miles, and its area may be roughly reckoned at about 150,000 square miles. This district is now represented by the modern Persian provinces of Irak Ajemi, Azerbaijan, Talish, Gililan, and parts of Kurdistan and Luristan. The capital of ancient Media was Ecbatana. It also included a second important town of that name, and Bagistana, the modern Belhistan.

**ME'DIALS** is a name often given to the three consonants *b, g, d*, respectively the labial, the guttural (or palatal), and the dental of the sonant mutes.

**ME'DIANT**, a musical term now simply applied to the Third degree of the scale, which lies *media ly* between the keynote and the dominant (Fifth). In the ecclesiastical modes the mediant was the favourite modulation after the dominant, and though in modes 1, 5, 9, and 13 its position was the third of the key (as with us), in the other modes it varied considerably from this.

**MEDIA TION** is the name given to a Gregorian tone as considered in itself, apart from the *intonation* which leads into it and the *ending* which closes it. The mediation

is therefore the main body of the chant, and is practically invariable within narrow limits, unlike the accessories named, which vary considerably.

**MEDIATIZA'TION**, a term used to signify the process of absorption of the smaller German principalities into the larger neighbouring states, by which they lost their *direct* connection with the empire, and became only *mediately* dependent upon it.

**MEDICAL PRACTITIONERS.** The law in reference to the public practising of medicine or surgery in Great Britain is chiefly regulated by the Medical Act of 1858 (21 & 22 Vict. c. 90), amended in 1860, 1873, and 1876. The principal measure established a General Council of Medical Education and Registration for the United Kingdom, to which some extensive powers were committed for the regulation of medical practice. In 1862 the council received a charter of incorporation so that it might prepare, and become the proprietor, of a list and description of official drugs, which should be called the British Pharmacopœia, which was published in 1867. By the original statute it was provided that the chief duty of the medical council should be the keeping of a register of qualified medical practitioners. Every person possessing one or more of the following qualifications is entitled to be registered on payment of a fee of £2 in respect of qualifications obtained before 1st January, 1859, and of £5 in respect of qualifications obtained on or after that date; fellow, member, licentiate, or extra-licentiate of the Royal College of Physicians of London, of Edinburgh, and of Ireland; fellow or member or licentiate in midwifery of the Royal College of Surgeons of England; fellow or licentiate of the Royal College of Surgeons of Edinburgh, of the Faculty of Physicians and Surgeons of Glasgow, and of the Royal College of Surgeons in Ireland; licentiate of the Society of Apothecaries of London, and of the Apothecaries' Hall, Dublin; doctor or bachelor or licentiate of medicine of any university of the United Kingdom; licentiate in surgery of any university in Ireland; doctor of medicine by doctorate granted prior to 2nd August, 1858, by the Archbishop of Canterbury; doctor of medicine of any foreign or colonial university or college, practising as a physician in the United Kingdom before 1858, who had taken such degree after regular examination. Registration is not absolutely compulsory, but only registered practitioners are entitled to recover charges for professional services or medicines by legal process, and they alone are authorized to hold appointments in the army, navy, and mercantile marine, in the public service, in any institution not supported wholly by voluntary subscriptions, and to sign medical certificates required by any Act of Parliament. The registrar of the General Medical Council is required to publish every year a correct list, in alphabetical order, of the names of all persons duly qualified to practise, with their places of residence; such list to be called the *Medical Register*, and to be accepted as an authority in a court of law. In addition to this the medical council keeps an unpublished list of medical students. A heavy penalty is imposed for the offence of obtaining registration by false representation, and any person who falsely pretends to be registered or who falsely assumes a medical title is liable to a fine of £20. Medical practitioners who are convicted of felony or misdemeanour may be struck off the register, and the council has power to remove the name of any medical practitioner who, after due inquiry, has been judged by them to have been guilty of infamous conduct in any professional respect. By the Act of 1876 (39 & 40 Vict. c. 41), it is provided that qualifications for registration may be granted to women, and by the Dentists Act of 1878 (41 & 42 Vict. c. 38) the system of registration was extended to dentists also. Pharmaceutical chemists are required to obtain a license from the Pharmaceutical Society by the Act of 1876. By the Medical Act of 1868

a physician is entitled to sue for his fees as legal debts, which before were considered *honoraria*, to be paid beforehand like the fees of barristers. See also APOTHECARIES, SOCIETY OF.

**MEDICI, FAMILY OF.** The oldest member of this family of whom there is any distinct record is Giovanni de' Medici, who at the head of 100 Florentines forced his way through the Milanese army in 1351. Other members of the family before and after him held important offices in Florence. Averardo dei Medici, for instance, was gonfaloniere of justice in 1314, and Salvestro in 1379: both were rulers of mark. The founder, however, of that greatness which his posterity enjoyed for several ages was Giovanni de' Medici, the great-grandfather of Lorenzo il Magnifico. By a strict attention to commerce he acquired great wealth; by his affability, moderation, and liberality he secured the confidence and esteem of his fellow-citizens. Without seeking the honours of the republic, he was gratified with them all—thrice prior of the Signoria and once gonfaloniere; and his lavish charity procured him the splendid title "Father of the poor." He died in 1429, leaving two sons, Cosmo, born in 1389, and Lorenzo, 1394, from the latter of whom is derived the collateral branch of the family which in the beginning of the sixteenth century obtained the absolute sovereignty of Tuscany.

Even in the lifetime of his father, Cosmo had engaged not only in the extensive commercial transactions by which the family had acquired its wealth, but also in the affairs of state. The authority which Cosmo and his descendants exercised in Florence, during the fifteenth century, consisted rather in influence than in any definite power. A party headed by Rinaldo d'Albizi attributed the unfortunate result of the war against Lucca to Cosmo, and obtained his banishment in 1433; but he was recalled in triumph within a year, to enjoy for the remainder of his life uninterrupted prosperity. Though a private citizen, he surpassed almost all the princes of Europe in his munificent patronage of literature and the fine arts. He established at Florence an academy for the explanation of the Platonic philosophy, at the head of which he placed the celebrated Marsilius Ficinus. By means of foreign correspondence he collected the Greek, Latin, and Oriental MSS. which formed the basis of the Laurentian Library. He also endowed numerous religious houses, and built an hospital at Jerusalem for the relief of distressed pilgrims. By his prudent conduct and benevolence he acquired the title of *Pater Patriæ*, "father of his country," which was inscribed upon his tomb; an appellation which, as it was founded on real merit, has ever since been attached to his name. He died 1st August, 1464. He had two sons, Giovanni and Piero; and a natural son, Carlo, who was canon of Prato. Giovanni de' Medici was one of the Florentine ambassadors who were sent, in 1455, to take the necessary oaths to Pope Calixtus III. He died in 1463.

Piero de' Medici succeeded to Cosmo's fortune and authority at Florence. He was nearly falling a victim to a base plot contrived by his minister Neroni. Piero died 3rd December, 1469, leaving by his wife, Lucrezia Tornabuoni, two sons and two daughters, Lorenzo and Giuliano, Bianca and Giovanna.

At the death of Piero de' Medici, his two sons jointly inherited his property; but Lorenzo succeeded him as head of the republic. In 1472 he re-established the academy of Pisa: for this purpose he contributed a large sum from his private fortune, in addition to that granted by the state of Florence. Lorenzo, like his father, narrowly escaped a plot laid to assassinate him. This time it was a conspiracy headed by the Pazzi family, and his brother fell a victim to the conspirators, who attacked the brothers actually while they were at divine worship. The citizens of Florence were so indignant at the atrocity that they killed two members of the Pazzi family, and hung the Bishop of

Pisa in his robes for assisting in the plot. This incident led to a war with Pope Sixtus IV., which was continued with varying fortune until 1480. Lorenzo now secured to the state of Florence a degree of tranquillity and prosperity which it had scarcely ever known before; but although the name of republic was retained the real liberty of Florence was lost, and the Medici were sovereigns in all but name.

Lorenzo distinguished himself above all his predecessors by the encouragement of literature and the arts. Indeed he richly deserved his splendid title, *Il Magnifico*, the Magnificent. His own literary productions are sonnets, canzoni, and other lyric pieces; some longer works in stanzas, some comic satires, carnival songs, and various sacred poems. Although the ancestors of Lorenzo laid the foundation of the immense collection of manuscripts contained in the Laurentian Library, Lorenzo has the credit of adding very largely to the store. On the discovery of the art of printing Lorenzo appreciated its importance. At his suggestion several Italian scholars devoted their attention to collating the manuscripts of the ancient authors, for the purpose of having them accurately printed. On the capture of Constantinople by the Turks in 1453, many learned Greeks had taken refuge in Italy; and an academy was now established at Florence for the purpose of cultivating the Greek language. Lorenzo also augmented his father's collection of the remains of ancient art. He appropriated his gardens in Florence to the purpose of an academy for the study of the antique. To this institution, more than to any other circumstance, is to be ascribed the sudden and astonishing advance which, toward the close of the fifteenth century, was made in the arts, and which, commencing at Florence, soon extended itself to the rest of Europe. Lorenzo il Magnifico died in 1492. A graphic account of his death-bed interview with Fra Girolamo Savonarola, prior of St. Mark's monastery, is given by Burmanni. Lorenzo acknowledged the commission of three principal offences: the sacking of Volterra, the appropriation of charitable funds, and the execution of innocent persons on suspicion of being implicated in the Pazzi conspiracy. The priest-reformer refused him absolution until satisfied of three things: his sincere faith in God, his restitution of wealth improperly acquired, and the restoration of Florentine freedom. The dying statesman assented to the two first demands, but to the third made no reply, and turned his face to the wall. At the time of his death he was forty-two years old. Lorenzo had three sons (Piero, Giovanni, and Giuliano) and four daughters. Giovanni went into the church and ultimately became pope, under the name of Leo X.; and Giuliano, having allied himself by marriage to the royal house of France, became Duke of Nemours.

Giuliano, the brother of Lorenzo il Magnifico, had left an illegitimate son, who was brought up under the protection of Lorenzo, and was destined to act an important part in the affairs of Europe. The final extinction of the liberties of Florence, the alliance of the family of Medici with the royal house of France, the expulsion of Henry VIII. of England from the bosom of the Roman Catholic Church, are principally to be referred to this illegitimate son of Giuliano de' Medici, who, having become pope under the name of Clement VII., guided the bark of St. Peter amid many dangers and disasters through the severest storm which it has ever experienced.

Piero, the eldest son of Lorenzo il Magnifico, succeeded him in the administration of Florence. The invasion of Italy by the French under Charles VIII. is matter of history. The plundering of the palace of the Medici, and the dispersion of the valuable library which they had collected, are among the misfortunes which befell Florence during the same period. Piero, by his base treaty with Charles VIII., whom he sought to buy off with Leghorn

and Pisa, prepared the downfall of the state which his forefathers had contributed to raise and enlighten. He was banished in 1494, and died in exile, fighting for the French. The Medici were restored by Pope Leo X., but were expelled from Florence by the turbulent citizens in 1527. They were again restored by Pope Clement VII. and the Emperor Charles V. in 1521. Two years later Alessandro de' Medici, the natural son of the Duke of Urbino, and the grandson of Lorenzo il Magnifico, became the first Duke of Florence, and on his assassination by his kinsman Lorenzaccio in 1537, was succeeded by Cosmo I., or the Great, born in 1519, died in 1574. This able, prudent, and unscrupulous man greatly extended his power, crushed the liberties of Florence, but, as some compensation, extended its territories, and finally, after his acquisition of Siena in 1564, by papal grant assumed the title of Grand-duke of Tuscany, a title which was not finally extinguished till the erection of the Italian kingdom in 1860. The Medici themselves held it until Giovanni Gastone, the last Medici grand-duke, died in 1737, when Tuscany passed by exchange to Francis, duke of Lorraine (afterwards the husband of Maria Theresa and Emperor as Francis I.) in accordance with the treaty made two years before between the Emperor Charles VI. and the Kings of France and Spain, Lorraine being required by Louis XV. as a state for his father-in-law, Stanislaus Lecziński, the deposed king of Poland. The last of the Medici was the Electress Palatine, sister of Giovanni Gastone, and she died childless in 1743. The notorious Caterina, better known under the French form *Catherine de Médici*, was the grand-daughter of Piero, the traitor, he who betrayed Florence to Charles VIII. She married Henry II. of France in 1533 through the intrigues of Pope Clement VII., and was the mother of three French kings. [See CATHERINE DE' MEDICI.] Another French queen was MARIA DE' MEDICI (see that article), who married Henri Quatre in 1600, and became the mother of Louis XIII. and the patroness of Richelieu. She was the niece of Ferdinand, the reigning grand-duke of that time, and the daughter of Francis I., grand-daughter therefore of Cosmo the Great, first of the grand-dukes of Tuscany.

**MEDICINE**, a science the object of which is the preservation of health and the cure of disease. In its fullest sense the term includes all the branches of the healing art; in a narrower sense it is used to comprise one great division in contradistinction to *surgery* and *obstetrics*. In practice, besides the fundamental division into internal and external medicine, or medicine proper and surgery, there are numerous subdivisions, which it is the tendency of modern habits to increase. Chief among the branches into which medicine is divided are anatomy, physiology, pathology, therapeutics, hygiene, materia medica, and pharmacy. In highly civilized centres also we find that certain members of the medical profession devote their attention to a single class of diseases, and we have specialists in gynecology (diseases peculiar to women), midwifery being usually associated with this branch; in dermatology (diseases of the skin); in ophthalmology (diseases and injuries of the eye); laryngology (the diseases pertaining to the throat); psychological medicine, which deals with mental disease; otology (diseases of the ear); dentistry, &c.

*History of Medicine.*—The history of medicine is more complete and full than that of any other science, with the exception of astronomy. It is quite impossible to say at what stage of civilization the recognition of states of disease first dawned upon man, but the earliest writings upon medicine which are known, viz. those of China, imply that the subject was systematically studied at a period 2500 B.C. So far as the Western world is concerned, however, the history of medicine begins with ancient Egypt, which was the earliest home of medical skill for the region of the Mediterranean basin. Whence the Egyptians derived their

knowledge, or whether the study originated with them, it is impossible at the present stage of human knowledge to ascertain. It is certain, however, that the study reached a high state of development in that country, and by a curious anticipation of modern practice the physicians and surgeons of that country divided medicine into numerous branches, and every part of the body was studied by a distinct practitioner. Representations of some of their surgical operations have been found upon the monuments of Beni-Iassan, and in the book of Genesis we read that Joseph committed the body of Jacob to the physicians for embalming. How far the ancient Jews profited by this knowledge during their long stay in the neighbourhood of Egypt is uncertain, as the date of the Mosiac legislation is at present a matter of controversy, but the high hygienic value of many of the provisions of the Jewish law is beyond all question. The necessity for isolation and cleanliness as methods of protection against contagious disease receives there the fullest recognition, and there can be no doubt that the Jews, from a very early period, paid much attention to the study of medical science. The books of the Old Testament contain many references to medicine, and though there are hints of a rivalry between those who practised it and the priests (2 Chron. xvi. 12), we have in the apocryphal book of Ecclesiasticus (xxxviii. 1-15) some excellent advice as to conduct during sickness, and the bestowal of high praise upon the medical profession.

The Greeks had a tradition that Cheirón the Centaur was the first to introduce a knowledge of medicine among them; and in the Homeric poems we have ample evidence that the medical study had made considerable advances at the period in which they were composed, or at any rate that its professors were held in high honour. The pupil of Cheirón, Æsculapius (Asklēpios), so improved the art that he was deified as the god of health. His sons, Machaon and Podalirios, are numbered among those who accompanied the Grecian army to the siege of Troy. It is commonly said that the temples of Æsculapius were the earliest hospitals, and that the priests of these temples, the reputed descendants of the deity, termed the Asclepiads, were for several generations the chief or only practitioners of medicine in Greece. This view is controverted, however, by some modern scholars, who contend that the study of medicine was carried on independently of the temples of Æsculapius, and that people resorted to the latter in the same way in which pilgrims resort to miraculous springs or wells to-day in Roman Catholic countries, and not for the ordinary methods of healing; and further, that the title of Asclepiad was given to physicians as well as priests, as a complimentary allusion to their connection with the god of healing.

However this may be, we find that in the sixth century before the Christian era, medicine with other sciences began to be more philosophically studied in Greece, and among the first of those who devoted much of their time to the investigation of the structure and functions of the animal body was Pythagoras. His pupils, Demokritos and Hérakleitos, have the reputation of being the first to dissect the human subject, and they appear to have added considerably to the knowledge both of anatomy and of practical medicine, while their contemporary, Herodicos, first introduced the practice of gymnastic exercises, which afterwards formed so large a part of medical treatment. But the most remarkable name in the history of medicine in Greece is that of Hippokratēs, one of the Asclepiads, who was born at Cos (where one of the chief temples was erected) about 460 B.C., and was the pupil of Hérakleitos and Héródikos. It is not too much to say that this wonderful man contributed more than any other single individual of any age to the advancement of the study of medicine and surgery, and it has been observed by a modern writer on the history of medicine, that the medical

art, as it is now practised, and the character of the physician as it is now understood, both date for us from Hippocrates. Scholars are not agreed as to the genuineness of all the writings which have come down to us bearing his name, but there are enough of his undoubted works left to show that he established the study of medicine on a sound and rational basis, that he was a careful, patient, thoughtful observer of nature, and that he effected the most important improvements in the practice of both medicine and surgery. His sons Thessalos and Dracôn, and his son-in-law Polybios, were the most renowned of his descendants, and they are generally regarded as the founders of the celebrated Hippokratean or dogmatic medical school. For the century which followed the death of Hippocrates his disciples were content to follow in the footsteps of their master, and to yield unqualified assent to his doctrines, but the dispersion of Greek science through the world by the conquests of Alexander and his successors, led to the formation of seats of learning elsewhere than in Greece, in some of which study took an independent course. In medicine we find the establishment of the Alexandrian school forms the next most important epoch. Under the patronage of the Ptolemies the students of the Alexandrian school enjoyed many privileges, and every facility was afforded them for anatomical investigations. There is good reason to believe that vivisection of the human subject was also practised upon the bodies of criminals who had been condemned to death, and who were handed over to the anatomists for this purpose. The most celebrated teachers of that period are Herophilos, a Greek of Chalkêdôn, a skilful anatomist, and a follower of Hippocrates, and Erasistratos, his rival, a man of independent views, who took up a position of antagonism to the Hippokratean school. From the rivalry of these two men and their respective disciples there arose the two sects of the Dogmatists and the Empirics, and for some centuries afterwards every physician ranged himself in one of the two divisions. By the Dogmatists it was maintained that the science of medicine must be based on a knowledge of the healthy structure and functions of the body, of the operation of medical agents upon it, and of the changes wrought in it by the progress of disease; while the Empirics declared that such knowledge was unattainable, was also unnecessary, and they professed to base their whole treatment upon experience. They included in the latter term observation, the records of observation or history, and judgment of analogy. The progress of medicine may have been impeded to some extent by the controversies of the rival sects, but there can be no doubt that the Alexandrian schools added largely by their labours to the stock of medical knowledge, and their surgeons attained a high degree of skill in operating.

During the early periods of the Roman Empire medicine seems to have been little cultivated, and according to Pliny (xxix. l.) Rome was for 600 years without professed physicians, though not entirely without medical knowledge. This is probably an exaggeration, but it is only as an importation from Greece that the medical profession can be traced in the first instance at Rome. The first Greek physician practising in Rome whose name has been preserved, was Archagathos the Peloponnesian, who settled at Rome in 218 B.C., but who was afterwards banished. The first individual of any eminence who practised medicine in Rome was Aesclepiades of Bithynia, the friend of Cicero, who flourished in the century before the commencement of the Christian era. He seems to have been skilful both as a physician and surgeon, and one of his pupils, Themiskôn, became the founder of a new school called the Methodic, which took up an intermediate position between the Dogmatists and the Empirics. The Methodic school lasted for some centuries, though it soon became subdivided into numerous sects, chief among which were the

Pneumatics, who traced healthy and diseased action alike to the influence of the supposed *pneuma* or universal soul, and the Eclectics, who sought to gather from all the other conflicting sects that which was best in each. The former are represented by Athenaios, who lived in the first century after Christ, while the most celebrated of the latter was Archigenês of Apamea, who is mentioned by Juvenal, and who practised at Rome in the time of Trajan. But the most remarkable medical writer of this age was Celsus, in whose work, "*De Medicinâ*," the progress and condition of medicine previously to, and during his life, are amply detailed. [See CELSUS.] This great work seems to have been neglected by the physicians, and it was not until the fifteenth century that its value and importance were recognized. As an evidence of the progress that had been made in surgery, it may be mentioned that Celsus refers to the operations of lithotomy, trepanning, the removal of cataract by depression, the treatment of fractures and dislocations, the reduction of hernia, and the application of the ligature to bleeding vessels, while in the works of Antullos, a contemporary, there are directions for the operation of tracheotomy, and references to the treatment of hydrocele by incision, and the operation of extraction for cataract.

The individual whose history forms the next chief epoch in the history of medicine is Galen, who was born at Pergamos about 130 A.D. A sketch of his life will be found in another part of this work [GALEN, CLAUDIUS], and it will be sufficient to note here that his contributions to the science of medicine, and his selections from the works of his predecessors, were of such importance that his writings came to be regarded as of supreme authority in the practice of medicine. For a long period after his death physicians were content to reproduce and comment upon his works, and to imitate as closely as they could his practice. From the time of Galen to the seventh century the only names of any repute are Sextus Empiricus, Oribasios, Aetios, Alexander Trallianus, and Paul of Ægina; after the death of the last of these no medical work of the least merit was published in the Greek language. It was by means of the works of Galen in Latin translations that the study of medicine was maintained through the early part of the mediæval period; but from the seventh to the twelfth century the only school to make any progress was the Arabian. When the Mohammedan conquests had become consolidated, and the conquerors found time to cultivate the arts of peace, schools of medicine were established at all the centres of Moslem power. The writings of Hippocrates and Galen were soon translated into Arabic and diligently studied; and all the earliest Arabian works on medicine, as those of Ahrun in the eighth and Serapion in the ninth century, are little more than transcripts of those of Galen, with notes and commentary. About the end of the eighth century public hospitals began to be built among the Arabs, and the schools of medicine and surgery were associated with them. Their knowledge of surgery seems to have been derived chiefly from the writings of Paul of Ægina, a learned and skilful Greek surgeon of the seventh century; but as time went on some eminent teachers arose among them, whose names must ever be associated with the history of medicine. Among these the most illustrious are Rhazes, who lived in the tenth century, and who was the first to describe accurately small-pox and measles; Ali-Abdas, a Persian, who lived about the end of the tenth century, and whose handbook was regarded for centuries as the standard authority; Mesua, the obscure author of a highly esteemed work on materia medica; Abulcasis, a physician of El Zahra, near Cordova, who prepared an encyclopædia of medical knowledge, the surgical portion of which was especially valuable; Avicenna, the prince of physicians; and Averroës, whose fame is equally great in philosophy and medicine. Over 300 medical writers in

Arabic are known to European scholars, the great majority of whose works yet remain in manuscript; but it is not difficult to form a fair idea of the work of the Arabs in medicine from those books which have been translated or printed. In surgery the Arabs made no advance upon the Greeks, while in anatomy and physiology they distinctly lost ground. They made, however, some real advances in pharmacy, and their studies in chemistry, and the wide extent of their commercial relations, enabled them to add several important remedies to those previously known. In the Arab writers, too, we have the correct description of several diseases unknown to the Greeks, and a more complete account of others previously but imperfectly known.

From the decline of the Arabian school in the twelfth century to the beginning of the fifteenth, the history of medicine presents few circumstances of interest, and the literature, though voluminous, is essentially second-hand, consisting as it does chiefly of commentaries on Hippocrates, Galen, Avicenna, and of other standard writers, or of compilations of even less value. The dissection of the human subject was first publicly practised by Mondini at Bologna, about the year 1315, and it was just before this that the first English work on medicine that obtained any general repute was composed by Gilbert under the title of the "Compendium Medicinæ." With the revival of learning in Europe the works of Hippocrates, Celsus, and Galen assumed a position of high authority, and the writings of the Greek physicians were speedily translated into Latin, in order that they might be rendered available for the study of the medical profession. Among the results of this study must be reckoned the impulse given to anatomical research, and the increased attention that was paid to the investigation of medicinal plants. In the fifteenth century the celebrated Paracelsus arose as the leader of a revolt against the established systems of medicine. He publicly burned the works of Avicenna and Galen, boasting that his own shoe-buckles contained more learning than these authors, and in the place of the dogmatic theories then in vogue he endeavoured to establish a strange mystical system of his own. He seems to have possessed some knowledge of chemistry, and he introduced many chemical remedies and metallic preparations, as well as some new vegetable preparations, the most important of the latter being the tincture of opium. He founded a sect which long survived as that of the chemical physicians, some of whom were earnest students, but many of whom were merely quacks and impostors. The fifteenth century was marked by the first appearance of the mysterious sweating sickness in England, and syphilis became very prevalent in Southern Europe, having been, according to some accounts, introduced by the followers of Columbus on their return from the discovery of Hayti. It was in the fifteenth century also that the whooping-cough and scurvy were first described. The appearance of these diseases, which were unknown to the ancients, gave a great impulse to the original study of medicine, as the old remedies proved insufficient to enable the doctors to deal with them.

In the middle of the sixteenth century a most important epoch commenced in the revival of the study of anatomy through the labours of Vesalius, who, disregarding the general obloquy which he incurred, carefully studied the structure of the most important parts of the human body. From the time of Vesalius the study of anatomy was diligently pursued, and surgeons began to inspect the bodies of the dead to ascertain the nature of the disease from which the patients had suffered. In the sixteenth century also the important step was taken of giving clinical lectures at the hospitals, Montanus of Padua being the first to set the example. The study of anatomy resulted, in the seventeenth century, in several most important and interesting discoveries, as that of the circulation by Harvey, of the absorbents by Asellus, of the process of respiration by

Malpighi, and numerous others. Among the most celebrated men of the seventeenth century may be enumerated Glisson, Bartholin, Rudbeck, Fabricius, Hooke, Sylvius, Willis, Fallopius, and Sydenham. The latter, a friend of John Locke, has been termed the English Hippocrates, nor is the title undeserved, for in addition to the many important improvements in practice which he introduced, by his careful observation of nature, and his disregard of the theories which then divided the medical world, he enriched the science of medicine with a new method, which has proved of the highest value. Somewhat later we have Stahl, the founder of the system of animism; Hoffman, whose medical theories were based upon a complete and mystical theory of the universe; and the much greater Boerhaave, who made no attempt to reduce medical knowledge to a uniform system, but who was one of the greatest teachers of the science that ever lived.

Among the pupils of Boerhaave were Van Swieten, who founded the Vienna school of medicine, and Haller, whose experiments in physiology were of immense value, and who was among the first to investigate the influence of medicines on healthy bodies. About the same time Morgagni conducted a series of prolonged and careful investigations in morbid anatomy, and the publication of the results of his studies, when he was in his eightieth year, served to initiate a movement which has lasted until the present day. Before the time of Haller the cases of Harvey, Glisson, Malpighi, and others, who devoted themselves to the simple observation of facts and the evident deductions from them, were exceptional; but since his time the exceptions have rather been those who, with a comparative neglect of observation, have endeavoured only to find or support some theory by which all the phenomena they met with might seem explained. Haller's contemporary Cullen laboured hard to establish a complete system, which was afterwards called after his name, but he was also of eminent service in the study of practical medicine, and his former assistant and afterwards acrimonious rival John Brown, whose system, known as the Brunonian, enjoyed an extensive though short-lived popularity on the Continent, is acknowledged to have introduced many useful lessons in the same branch of study. With the gradual oblivion of the hypotheses of Cullen and Brown, the theoretical study of medicine disappeared, and at the present day we may certainly be said to be without any general medical theory.

The present century has, however, been marked by more progress in medical science than any period of the same length in any former age of the world. It would be impossible to mention even the names of the distinguished anatomists, physiologists, pathologists, physicians, and surgeons, by whose labours and discoveries the science has been enriched during this period. Foremost in the march of discovery we find a band of eminent investigators and teachers of the French school, but they have been closely followed and emulated by the physicians and surgeons of Great Britain and Germany, and in no former epoch have so many sure advances been made in all departments of medical science.

During this period a large number of important additions have been made to the materia medica, and every year serves to introduce new remedies and fresh preparations of old ones. Among these we may specially notice quinine, strychnia, iodine, and the iodides, truri, atropia, physostigmin, veratria, bromide of potassium, phosphorus, morphia, ether, and chloroform. The influence of cod-liver oil and the hypophosphites in consumption, of iron in anæmia, of digitalis in heart disease, of ipecacuanha in dysentery, and of bromide of potassium in cases of epilepsy, all serve to illustrate the progress made in the treatment of disease during the present century. New and valuable instruments, such as the stethoscope, the ophthalmoscope, and the laryngoscope, afford the most important aid in the diag-

nosis of disease, while the microscope promises to lay bare the secret cause of a host of dangerous and infectious diseases. By the use of anæsthetics the most important operations of surgery can now be performed without causing either pain or terror to the patient, and by their means also the suffering attendant upon many forms of painful and incurable disease may be greatly mitigated and lessened. It is still unhappily true that there are many diseases which are beyond the power of medicine to heal or surgery to remove, and also that the development of civilization and the growing complexity of human affairs seem to bring with them new forms of sickness and increased danger from infection; but sanitary science is now recognized as a most important branch of medical study, and when its principles, now the possession of a few, become common property, and receive general recognition, we may expect the realization of a much higher standard of health than has ever yet been attained by any of the larger communities of men.

**MEDINA** (Arab. *Medinah-el-Nebi*, the Prophet's City), the second holy city of the Mohammedans, and the place where their Prophet was buried, is situated in that part of Arabia which is called El Hejaz or Hedj, about 110 miles from the town of Yembo on the Red Sea, which is the harbour of Medina. The population is said to be about 15,000.

The city forms an oval, about 8000 paces in circumference, and is 3000 feet above sea-level. The castle is built on a small rocky elevation, and strongly fortified. The whole is inclosed by a thick wall of stone, between 35 and 40 feet high, flanked by about thirty towers, and surmounted by a ditch. It is well fortified for an Arabian town, and has always been considered the principal fortress in Hejaz. Three well-built gates lead into the town. The houses are handsome, entirely of stone, and generally two storeys high. As the stone is of a dark colour, the streets have rather a gloomy aspect, and are for the most part very narrow, often only two or three paces across; a few of the principal thoroughfares are paved with stone. There are only two large streets which contain shops. The great mosque, containing the tomb of Mohammed, is the only temple. There are two fine medresses or colleges. The suburbs extend west and south, and cover a larger area than the city itself. They are separated from it by an open space, narrow on the south, but forming on the west a large public place. The greater part of the suburbs consists of large courtyards with low houses built round them, and separated from each other by gardens and plantations: they are inhabited by the lower classes of the town and those who are engaged in agriculture. Each courtyard contains thirty or forty families, so as to form a hamlet by itself.

The town is supplied with sweet water by a subterranean canal (about 25 feet under ground) which runs from the village of Koba, about three-quarters of a mile distant in a southern direction; and there are numerous wells attached to the houses. This plentiful water-supply made Medina a considerable settlement of Arabs long before it became sacred among the Mohammedans by the flight, residence, and death of their prophet.

The mosque containing the tomb of Mohammed is situated towards the eastern extremity of the city, and, like that of Mecca, forms an open square surrounded on all sides by covered colonnades, with a small building in the centre of the square. The colonnades are much less regular than those of Mecca. Near the south-eastern corner of the mosque stands the famous tomb, detached from the walls so as to leave between it and the southern wall a space of about 25 feet, and 15 feet between it and the eastern wall. The inclosure which protects the tomb from visitors is formed of a very close iron railing, pierced with several small windows. This inclosure is entered by four gates,

three of which are constantly kept shut, and one only is opened every morning and evening to admit the eunuchs, whose office it is to clean the floor and light the lamps. The whole of the inclosure is covered with a lofty dome, rising far above the domes which form the roof of the colonnades, and visible at a great distance from the town. As soon as pilgrims to Medina catch sight of it they repeat some prayers.

The inhabitants of Medina, like those of Mecca, are not Bedouins, but strangers who have visited the place as pilgrims and afterwards settled there, or the descendants of such strangers. Medina is not so great a place of commerce as Mecca, and the merchants are not so rich, but it has the advantage of having a considerable tract around which is fit for cultivation.

**MEDITATIO FUGÆ WARRANT**, in the law of Scotland, is a writ by which a debtor, supposed to be about to make his escape from the country, is arrested and kept in custody until he pay the debt, or find security to pay it, if he shall be judicially found liable to do so.

**MEDITERRANEAN** (or *Midland Sea*; Lat. *Mare Internum*; Ger. *Mittelmeer*), the name of the sea between the Straits of Gibraltar to the west and the Dardanelles and Syria to the east. The Greeks and Romans called it the Inner Sea, and sometimes Our Sea, and had special names for its various parts. The Hebrews called it the Great Sea or Great Sea Westward, the Red being the Hinder Sea. The name Mediterranean first occurs in a geographical work by Solinus, who seems to have flourished about A.D. 238. The distance from Gibraltar to the furthest shore of Syria is about 2000 miles, and the narrowest part, between Sicily and Africa, is 79 miles across. It is naturally divided into two basins, a west and an east, by a line extending from Cape Bon across Sicily to Cape Spartivento, a submarine ridge, over which there are soundings of 80 to 90 fathoms, so that Sicily may almost be regarded as a dependency of Africa. The isles of Lampedusa, Linosa, and Pantellaria are planted on this ridge. The bottom of Gibraltar Strait forms an inclined plane, plunging rapidly eastward. Between Tarifa Isle and Alcazar Point,  $9\frac{1}{2}$  miles across, and the narrowest part of the strait, the depth is 510 fathoms; a little east, 700 fathoms; between Gibraltar and Ceuta, 12 miles, it is 950 fathoms in mid-channel; the depth increases eastwards, till it reaches 1400 and 1600 fathoms; and south-east of Sicily, 2000 fathoms; in the Levant, 1800 fathoms. Here also the bank called the Adventure yields good anchorage, and abounds with fish. North-west of Cyprus there are soundings of 650 fathoms. Round Corsica and Sardinia there are soundings of 2000 fathoms. Close to Nice the water is 700 fathoms deep.

The various parts of the Mediterranean are known by different names. That portion of it which lies east of Candia is called the Levant, as lying towards the sun-rising; the part north of Candia is called the *Ægean Sea* or the Archipelago; the Ionian Sea lies between Greece and Italy; the Adriatic, east of Italy; and the ancient name of Tyrrhenian or Tuscan Sea has been of late restored to that portion which lies between Italy on the east and Corsica, Sardinia, and Sicily on the west and south. The basin of the Mediterranean really extends considerably to the west of Gibraltar Strait, as far as a line joining Cape Trafalgar to Cape Spartel, for there is found to be between these a submarine ridge, over the north part of which the depth is only 50 fathoms, and over the south part 150 fathoms, while the depth in the strait is 510 fathoms. The area, including all these, is 972,137 square miles. If we include the series of gulfs called the Sea of Marmara, Black Sea, and Sea of Azof, which are given off northward, there will be a total of 1,449,287 square miles for this great basin. The limits extend from the sources of the Nile, lat. 2° S., to those of the Duieper, lat. 56° N. The former and the



Rhone are the only large rivers which enter the basin proper. If we commence a general survey of the sea at its eastern extremity, we find that the shores of Syria are mountainous between Tripoli and Tyre, but present in many places a large extent of low and flat coast. The coast of Anatolia, the west portion of Asia Minor, is mountainous, rising in some parts very near the sea to 7000 and 8000 feet. About 20 leagues from the nearest coast of Syria lies the island of Cyprus. The islands of Candia, the name given by the Venetians to the ancient *Crete*, and of Rhodes, are also in this part of the Mediterranean. The numerous islands in the *Ægean*, between Greece and Asia Minor, forming the Grecian Archipelago, are subject to very heavy squalls. Their sides are steep, and the water very deep. The coast of the Morea, the ancient *Peloponnesos*, is mountainous, some of the summits exceeding 6000 feet. The coast of Albania, including the ancient *Illyricum*, is more mountainous and rugged. Off this coast and the Morea lie the Ionian Islands. Proceeding northward we enter the Adriatic, the entrance of which is 40 miles broad. The shores of Dalmatia and Istria afford numerous fine harbours, and above Ragusa are studded with islands affording good anchorage.

The southern extremity of Italy is contiguous to Sicily, between them being the well-known Scylla and Charybdis. Scylla is considered in these days as an ordinary rock, but Charybdis is a vortex which might, on occasions, prove dangerous to a small vessel. The Gulf of Lyons, like all the gulfs on the north shores of the Mediterranean, is subject to violent gales from the northward, which sometimes last three days. The islands of Sardinia and Corsica, lying north and south, extend over 80 leagues of the sea between Genoa and Tunis. The small island of Malta is from its situation in the narrow sea between Sicily and Africa, and its excellent harbour, the great naval station of the Mediterranean, and second only in importance to Gibraltar.

The east coast of Spain presents numerous harbours, and is particularly adapted to navigation by steam vessels. The Balearic Islands, Majorca, Minorca, with Iviça, are adjacent to the Spanish coast. Gibraltar, standing at the foot of a rocky mountain 1430 feet high, is a place of extraordinary strength. From its situation, and the narrowness of the straits dividing Spain from Africa, which are only 9 miles across, Gibraltar is the key of the Mediterranean. A constant current sets through the Straits of Gibraltar from the Atlantic at the rate of 2 or 3 miles an hour, and is felt as far as Cabo de Gata in Spain, 150 miles distant. It has also been long known that in addition to this another current is constantly flowing into it from the Black Sea, besides the numerous rivers pouring in always abundantly, and the question had often been asked—How is it that the great midland sea does not become over-full? The answer is—Because, while a surface-stream flows in through the Strait of Gibraltar, an under-stream is constantly flowing out. The existence of this under-current had, however, been often questioned; but the matter was finally set at rest in the autumn of 1870, when Dr. Carpenter made a series of very interesting dredging experiments in different parts of the sea. He found that while an immense amount of the water is carried off by evaporation, what remains becomes, owing to the accumulation of salt consequent on evaporation, specifically heavier than the water flowing in; thereby it sinks, and is carried out in an under-current through the Straits of Gibraltar. The existence of this strong under-current Dr. Carpenter proved, not only by numerous soundings in different parts of the Mediterranean, but by experiments made with a drag in the straits; especially by bringing up some of the water of this under-current, and ascertaining it to be more charged with salt than that at the surface flowing in directly from the Atlantic.

Ceuta, opposite Gibraltar, is a strong fortress. The African shore from this place to Tripoli is hilly, and in some places sandy and sterile. On the low shelving shores of parts of these coasts the strong northerly winds do not blow home, and accordingly a ship may bear up on a lee shore and anchor in smooth water. Proceeding towards Barca, we pass the Gulf of Sydra or Greater Syrtis, an object of much dread to ancient seamen on account of marshes and supposed sea monsters.

The navigation of the Mediterranean dates from a period of great antiquity. That the Phœnicians and the Carthaginians navigated it at a very early date is quite certain. Strabo in the first century describes it as being divided into three basins: the first lying between the Columns of Hercules and Sicily, the second between Sicily and Rhodes, and the third between Rhodes and the shores of Syria. His geographical positions have frequently been found wide of the truth. The sirocco or south-east wind has always been noted for its depressing effects upon the animal system. Water-spouts are very common. Fish abound, especially the tunny, anchovy, and sardine; coral, sponge, and ambergris are found. The Mediterranean is not tideless, as has been often asserted, but the extreme rise and fall does not exceed 3 feet, and as a rule cannot be discriminated from the effects of atmospheric changes.

**MEDJIDIEH**, as a coin, is only another name for the Turkish pound or lira (L.T.), a coin deriving its name from the Sultan Abdul Medjid (1840–61), in whose reign it was first struck. It consists of 7·216 grammes of gold, .916 fine, and is therefore worth exactly 18s. sterling.

**MEDJIDIEH, ORDER OF THE**, is a Turkish order of dignity, deriving its name from Abdul Medjid, and created during the crisis preceding the Crimean War. It was used largely to reward the British and French allies of the sultan. The medal is a silver sun of seven triple rays, alternating with as many crescents and stars, with an enamelled central device and the sultan's name. The ribbon is red, with green borders. There are five classes in the order.

**MED'LAR** (*Mespilus germanica*) is a well-known fruit, a native of Europe and Western Asia. It is not considered by Sir J. Hooker to be a native of England, though it is found apparently growing wild in hedges and thickets in Surrey, Sussex, and Cheshire. Benthian and Hooker, in their "*Genera Plantarum*," place the genus under *Pyrus*. The taste and flavour are peculiar, and greatly esteemed by some persons. The fruit is not fit to eat until it has begun to decay. The change which it thus undergoes is called blotting. [See **FRUIT**.] The Japanese medlar is otherwise called the **LOQUAT**.

**MEDULLA** is the Latin name for marrow or pith. In anatomy it is used as the name of various soft marrowy tissues. The chief of these are the *medulla*, or marrow contained in the medullary cavity of the long hollow bones of the bodies of vertebrates, as described in the article **BONE**; and the important enlargement of the spinal marrow, just before it enters the brain, called the *medulla oblongata*, the centre of the reflex actions of the body, as described in the article **BRAIN**. The medulla or pith of hair is made up of irregularly shaped cells, filling the central space which occurs in many varieties of hair, and which contain sometimes pigment granules or fat, but generally air. [See **HAIR**.] Different from all these is the medulla of the kidney, which is simply another name for the pyramidal or inner portion of the kidney, filled with roughly pyramidal masses of urine tubes. The outer part of the kidney is called the cortical, the inner the medullary portion. The nerve fibres (white), too, have their medullary portion, often called the "white substance of Schwann," and lying between the nerve streak and the axis cylinder of the nerve fibre. [See **NERVE**.] Finally, the lymphatic glands are divided (like the kidneys) into a cortical or outer part, and a medullary



or inner part. The latter is full of rounded cords, and the efficient vessels take their rise in it (the afferent vessels ending in the cortical portion).

**MEDULLA** is also the name given by older botanists to the pith of dicotyledonous plants, from a supposed resemblance to the spinal marrow (*Medulla spinalis*) of animals. The medullary rays are the processes of cellular tissue stretching out from the pith. These rays become much compressed during growth, and form the silver grain of the wood. The medullary sheath is the ring which surrounds the pith, composed chiefly of sap ducts. In monocotyledonous plants there is no proper distinction between the wood and the pith.

**MEDUSA** (Greek *Medousa*), in classical mythology, one of the three Gorgons, daughters of Phorkos and Kêto. Medusa was mortal, the other two immortal. She had been celebrated for her personal charms and the beauty of her locks; but Athênâ, in revenge for a violation of the sanctity of her temple by Medusa and the god Poseidôn, turned her locks into serpents, which had the power of petrifying those on whom she looked. She was killed by Perseus, who waited till she slept, then guided by her reflection in his mirror-like shield, struck off her head, and quickly enfolded it with a cloth. His protecting goddess Athênâ afterwards wore the head on her *egis* (shield or breastplate). Medusa bore a son, Chrusaôr, and a monster, the famous winged horse Pegasus (Pêgasos), to Poseidôn.

**MEDUSA** is a general name for the soft-bodied, bell-shaped animals belonging to the class Hydrozoa, which are found swimming on the surface of the ocean, and are often known as jelly-fish. The name medusa, originally applied to the Common Jelly-fish (*Aurelia aurita*) and its immediate allies, has now obtained a more extended meaning. It has been shown that throughout the class Hydrozoa in the life-history of every species two distinct forms typically occur—the first being permanently fixed, polyp-like in shape, and asexual; the second being bell-shaped, free-swimming, and sexual. The second of these forms may be called a medusa. The form and anatomy of a medusa are described in the article HYDROZOA. The Common Medusa (*Aurelia aurita*), which has a transparent, jelly-like body, is often seen floating on the surface of the ocean. There is only one fresh-water medusa known, *Linnocodium sowerbii*, which is a small form discovered in 1880 in a tank in the Botanic Gardens at Regent's Park, London.

**MEER-SCHAUM** (Ger. *meer*, the sea, and *schaum*, froth) is a hydrous silicate of magnesia. It is generally white, but often has a grayish-yellow or pink tint. It is amorphous, with a fine earthy texture, and is soft enough to be scratched by the finger nail. When dry it floats, but absorbs water greedily; its hardness is about 2, and specific gravity 1.5. It will form a lather with water, and is used by the Algerians as a substitute for soap; hence it is sometimes known as *sepiolite*. Meer-schaum is found in beds and irregular masses in alluvial deposits. On account of its absorbent properties it is often used to remove grease from articles, and for cleansing linen; but it is chiefly prized for the manufacture of tobacco-pipes, being light and porous; for this purpose it is first soaked in tallow, then in wax, and afterwards polished. Its principal source is Anatolia in Asia Minor, but it is also found in Greece and in Spain, where it is sometimes used as a building stone.

**MEG MUCKLE** or **MONS MEG** (or *Long Meg*), names given to an old-fashioned huge piece of artillery in the Castle of Edinburgh, which was made in the reign of James IV., about 1500, at Mons in Flanders. Cromwell notes it in his report on the occupation of Edinburgh. It was looked upon as a palladium, and old notes of charges exist

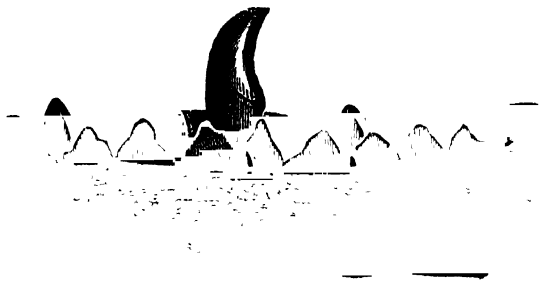
of tallow to "grease Meg's mouth," that the report might be louder, of ribbons to ornament her, of pipers to play before her, and extra horses, &c., to drag her about with the army. At the union there was some considerable apprehension lest the great piece should be taken away. This fate really befell the old gun in 1757, and so deep was the feeling excited that in 1828 Mons Meg was taken back from Woolwich arsenal to her old quarters in the Castle of Edinburgh, where she still remains.

**MEGACEROS** is a fossil genus of the deer family (Cervidæ), containing only one species, the Irish Elk (*Megaceros hibernicus*). This so-called Irish elk was a gigantic deer, intermediate between the fallow and reindeer, which lived in the Pleistocene epoch, but did not, so far as is known, survive into the historic period. It is not peculiar to Ireland, being found also on the continent of Europe and in England and Scotland. It is, however, most abundant in Ireland, being found not only in the clay or marl under the peat, but sometimes also in the peat itself. In England its remains have been found in lacustrine beds, brick-earth, red crag, and bone caves.

This magnificent animal is remarkable for its enormous spreading antlers, which attain an expanse of 10 feet from tip to tip, and in general character resemble those of the fallow deer on a large scale. To support these massive antlers the vertebrae of the neck in the male are enormously strengthened; in the female, in which the antlers were absent, the cervical vertebrae were smaller.

**MEGERA** (one of the Furies). See EUMENIDES.

**MEGALOSAURUS**, the name assigned by Buckland and Conybeare to an extinct genus of reptiles found in the Oolitic slate at Stonesfield, near Woodstock, and other localities. The *Megalosaurus* belongs to the order DINOSAURIA. It was a colossal animal, its length being calculated at between 40 and 50 feet. The animal probably walked like a cat, on its toes. The fore limbs are very small, and have five toes on each foot armed with prehensile claws. The hind foot has four toes. The vertebrae are biconcave. The sacrum has some resemblance to that of a bird. The teeth are sharp, recurved, and serrated, implanted in distinct sockets, and in the front of the mouth as well as at the sides. The figure shows the anterior extremity of the right lower jaw in side view, one-fourth



Extremity of the Jaw of the Megalosaurus.

natural size. There is no evidence that the skin was protected by plates or scales.

The femur, or thigh-bone, and tibia, or leg-bone, are nearly 8 feet in length severally, so that the entire hind leg must have been nearly 2 yards long, and the discovery of a metatarsal bone measuring 13 inches indicates that the foot was of a corresponding length.

That this gigantic reptile was carnivorous the structure of its teeth sufficiently declare; and from the large medullary cavities of the cylindrical and other bones, it is clear that it was a land animal. Its ordinary food is supposed to have been the herbivorous reptiles, crocodiles, and tortoises, whose remains occur abundantly in the strata

where those of megalosaurus abound. Megalosaurus occurs in the Wealden as well as in the Oolite in Europe.

**MEGAPODIDÆ.** See MOUND BIRDS.

**MEGATHERIUM** is the name of a colossal extinct mammal belonging to the order Edentata (or Bruta), and closely allied to the living sloths of South America. The megatherium, of which three species are now known, was confined to America, and ranged from the state of New York to Northern Patagonia.

For a long time the museum of Madrid afforded the only relics of the megatherium in Europe; they were found on the banks of the river Luxan, south-west of Buenos Ayres, and sent over in 1789; but the skeleton they compose is deficient in several of its parts. Nevertheless Cuvier was enabled to determine with wonderful accuracy the affinities of this extinct giant of the Edentata. The acquisition by the Royal College of Surgeons in 1832 of a collection of bones discovered in the bed of the river Salado, near Buenos Ayres, and in 1837 by the British Museum of further remains from Luxan, enabled the whole skeleton of the megatherium to be reconstructed, and supplied the material for the complete description by Professor Owen in 1861.

The megatherium must have been a most extraordinary animal. With the head and shoulders of a sloth, it combined in its legs and feet an admixture of the characters of the ant-eater and the armadillo. In height it was inferior to the elephant, but surpassed it in length, measuring 18 feet to the tip of the tail, and having far more massive bones. The skull is small relatively, and agrees generally with that of the existing sloth, but approaches the ant-eaters in the elongation of the toothless fore part of the upper jaw and the corresponding part in the lower. Teeth are altogether absent in the front of the month, as in all the Edentata. As in the sloths, the only teeth present are five upper and four lower on each side. These teeth are in the form of quadrangular prisms, and have their crowns provided with transverse ridges; they have no fangs, and continued to grow throughout life, and are composed of three tissues—vaso-dentine, true dentine, and cement, the first being innermost. The fore limbs were longer than the hind limbs. The scapula or shoulder-blade is massive. The clavicle or collar-bone presents a singular resemblance, but for its size, to the human clavicle; as Professor Owen remarks, no single bone would have better justified the conclusions of mediæval anatomists, when they ascribed large fossil bones to human giants. The two bones of the forearm, the radius and ulna, are well developed and capable of free rotation. The fore foot about a yard in length. The first digit, or pollex, is represented only by a stunted metacarpal bone. The next three digits are very large, and terminate in powerful curved claws, that of the third digit being the largest. The fifth digit, which is quite rudimentary in the sloths, has two short phalanges but no claw, being developed, as Owen remarks, as far as was needed for the purposes of terrestrial progression, when the weight of the body was chiefly thrown on the fourth and fifth toes, so that the third and claw-bearing toe did not reach the ground. The pelvis is the largest known among terrestrial mammals, and the femur or thigh-bone is also one of the most massive bones of this class, being nearly three times the thickness of the same bone in the elephant, and only twice as long as it is broad. The leg-bones, tibia and fibula, are short, massive, and ankylosed together at both extremities. The heel or calcaneum is almost as long as the rest of the foot. There are but three digits to the foot, answering to the third, fourth, and fifth. The first digit, or hallux, is quite absent, together with its corresponding carpal bone, which is all that remains in the case of the second digit. The third digit was armed with a large powerful claw, while the succeeding toes each had two small phalanges, but no claws.

The structure of this gigantic sloth thus known, it is comparatively easy to infer its habits and manner of life. From the general agreement of its dentition with that of the sloths, it is reasonable to suppose that, like them, it subsisted on the foliage of trees; but looking to the size and strength of the jaws and teeth, it seems probable that it, like the elephant, fed also on the smaller branches. Heavily constructed, its movements were slow; it could neither run nor leap; but it could tear up the earth from the roots of trees, and then raised up on a tripod, composed of the hinder limbs and tail, wrestle with the trees of the forest, tear them down, and thus gain access to their leaves and tender shoots or branches. The fore limbs seem more especially adapted for grasping the trunk of a tree; while the hind foot, which, like a pickaxe, had but one strong perforating and digging pointed weapon, was probably the instrument mainly employed in removing the earth from the roots, and detaching them from the soil.

It was considered by Cuvier, De Blainville, and others that the megatherium was covered with bony armour like the armadillos. The origin of this belief was the association with the bones discovered in 1832 at the river Salado of portions of dense tessellated armour, evidently belonging to an animal much larger than the existing armadillos. This armour has been shown by Professor Owen to belong to the *Glyptodon*, a huge extinct armadillo. The megatherium was probably covered with coarse hair like the sloths.

Several species of megatherium are distinguished, the first and best known being *Megatherium americanum*, from the late Pliocene or Post-pliocene beds of South America. A North American species, *Megatherium mirabile*, has been described from Georgia and South Carolina. Several allied fossil animals of huge size are known, such as *Myodon*, *Megalonyx*, and *Scelidotherium*. (Owen's "Memoir on the Megatherium or Giant Ground-sloth of America.")

**ME'GRIM**, also known as *Sick Headache*, *Nervous Headache*, or *Hemicrania* (Gr. *hēmi*, *kranion*, half the head, whence the French *migraine*, and our *megrin*), is a headache of a periodical character, usually affecting one side of the head more than the other; is almost invariably associated with nausea; is commonly ushered in by certain premonitory symptoms readily recognized by the sufferer; and is frequently preceded and attended by some affection of the senses.

The chief causes of this complaint are hereditary tendency, poorness of blood or anemia, all influences of a debilitating character, such as prolonged mental work, anxiety, grief, bodily fatigue, excess of any kind, poor and insufficient diet, bad smells, or the breathing of the impure air of crowded rooms or ill-ventilated workshops. Women are more liable to this complaint than men, and there are some who suffer from it more or less from the age of thirteen or fourteen up to the period of the change of life. It rarely affects men after the age of fifty or sixty, and women often secure an immunity at an earlier period. In the case of most persons the attacks recur at irregular intervals, and in the interim fairly good health may be enjoyed. By due care and attention the period of immunity may be lengthened and the severity of the seizures mitigated, while the latter may be brought on at any time by exposure to an exciting cause.

The first symptoms of an attack of megrim are usually a feeling of depression and uneasiness, which is generally, but not invariably, followed by a disturbance of vision. Beginning with a wavy glimmering on the outside of the field of vision, it is followed up by the appearance of zig-zag lines, which spread out and appear to come between the eye and the object looked at. Or there may be a number of dark specks before the eyes; one dark spot with a luminous border, or a dark patch of colour similar to that which is caused by looking at the sun. Numbness and tingling of the hands and arms are often noticed at the

commencement of an attack, and sometimes a limb will appear to "go to sleep" altogether, and there is a loss of power as well as of sensation. Occasionally there is, in addition, some mental confusion and an inability to speak clearly. The headache which follows these premonitory symptoms varies greatly in different individuals, and sometimes also in different attacks, but generally speaking it is of a severe and prostrating character. Some sufferers by a pardonable stretch of imagination have likened the pain to that of having a hole bored into the head, while others speak of it as being of a throbbing shooting character. As the attack progresses the headache becomes more severe, and though with this the disturbance of the sight declines, a feeling of nausea becomes a prominent symptom, and this is attended at times by retching and vomiting. A fit of sickness will in some cases bring an attack to a close, but more frequently the pain subsides gradually, and does not pass wholly away until some natural sleep has been obtained.

Sometimes a cup of hot strong tea or coffee, a little alcoholic stimulant, or a dose of sal volatile in water, taken when the first disturbance of vision is noticed, and followed by lying down for a time, will serve to prevent further trouble. If this fails, rest in a recumbent position in a darkened room will do as much as anything to mitigate the pain in the head. In cases where experience has proved the pain to be relieved by vomiting, a draught of warm water may be of service, while there are some who find affusion with cold water or the use of a cool wet bandage useful as means of alleviation. In very severe cases bromide of potassium in combination with a little tincture of henbane may be called for, or Guarana powder in fifteen-grain doses may be taken every three hours. The latter is a little uncertain in its action, but it has a high reputation for the treatment of this complaint.

In the interval between the attacks the patient should pay careful attention to general health, avoiding as far as possible the exciting causes of the complaint. Wholesome diet, temperance, fresh air, and moderate exercise are sovereign remedies for this affection, as well as for many more. Their efficacy may also be increased by the judicious use of mild tonic medicines, and such as tend to regulate the action of the stomach and bowels, but for this skilled medical advice is necessary. The drugs chiefly relied on are croton chloral, cannabis indica, iodide of potassium, the simple vegetable bitters, iron, nux vomica, arsenic, and quinine. Where megrim is caused by nervous exhaustion, cod-liver oil, if it can be taken, will be found very serviceable.

**MEHEMET ALI**, Viceroy of Egypt, was born at the port of Kavalla, in Albania, in 1768. He was one of the most remarkable men of the times in which he lived. By birth he was an Arnaout, that is, of Moslem faith but Greek race. In early life he was an humble tobaccoist; his tastes being more suited for a military career, he entered the army as a volunteer, and gained the favourable opinion of the governor of Kavalla by his success in suppressing piracy. The governor gave him his daughter in marriage, and this lady bore him his eldest sons, Ibrahim, Tousoun, and Ismail. In 1799 he headed a contingent of 300 Candian soldiers in an expedition to Egypt, where he co-operated with the British forces for the expulsion of the French. It was here that he laid the foundation of his military renown and his vast political ascendancy. In a short time he was enabled to seize the pashalic of Egypt, through the agency of the Memlukes. In 1805 he was made Pasha of Cairo; and in the following year received the pashalic of Alexandria, as a reward for his services to the Sultan of Turkey in bringing into order the chaos of Egypt, a fearful mass of confusion after the successive expeditions of Napoleon and of the British. But no sooner had he consolidated his authority than he turned against his old con-

federates the Memlukes, and massacred them in the narrow streets of Cairo, 17th August, 1805. However one of their number, Elfi Bey, who had gone to England to beg for help, now returned with the desired promises, and General Fraser arrived off Alexandria with 5000 British troops, 17th March, 1807. On this Mehemet Ali conceded all their old privileges to the Memluk Beys, so that all the Mohammedans joined together to drive the British out of Egypt. Fraser's losses were great, and when they reached 900 he felt that it was hopeless to remain and sailed away, beaten hopelessly, 14th September, 1807. The Memlukes were allotted the Fayoum and other places in Egypt, and apparently all was at peace. On 1st March, 1811, 470 of them, chiefs and retainers, were invited to the viceroy's palace in the citadel at Cairo. As soon as they were within the walls they were massacred all but one man, who leaped the ramparts on his horse and escaped to Syria. This Cairo massacre was repeated throughout Egypt, and at least 1200 Memlukes fell. [See MEMLUKS.] Mehemet Ali had now no difficulty in making himself master of Upper Egypt, and later on of the Soudan. He afterwards undertook the reduction of the Wahabis, and assisted the sultan, though unsuccessfully, in his attempts to subjugate the Greeks. About this time he reorganized his army on something like European principles, built a fleet, and erected fortresses and arsenals, made the Mahmoudieh Canal from Alexandria to the Nile, at a fearful cost of human life, and, finding that the fellahen or peasantry of Egypt were unable to rise to the conception of manufactures, he established mills and factories of his own on a truly gigantic scale, all over Egypt. He also began the fine Egyptian cotton plantations. He lost a terrible amount of money in these schemes, but they nevertheless resulted in incalculable benefits. He quite eclipsed the feat of Peter the Great. His will was iron; right or wrong, nothing stood in his way. His ambition, however, received a severe check by the destruction of his navy at Navarino in 1827. In 1830 he entered into a contest with the sultan for the possession of Syria, when the superiority of his disciplined army became manifest, and in 1832 he succeeded in carrying his victorious arms within a few days' march of Constantinople; but the contest was settled by the intervention of the European powers, though Syria was ceded to him on condition that he should acknowledge himself a vassal of the sultan. For seven years subsequently Mehemet Ali retained the uncontrolled dominion of Egypt, and continued to direct his energetic mind to the internal improvements of his newly-acquired kingdom. In 1839 the sultan invaded Syria, and was crushed by his great vassal, who now demanded the hereditary succession to his vast dominions. Arabia was under his influence, and he evidently meant to found an Arab Empire, leaving the Turks to the sultan. The great European powers hastened to the cry of the sultan, and after a short desperate fight against all Europe single-handed, the old Arnaout chief had to succumb. He obtained the hereditary succession, but his great prestige was ruthlessly torn away. He pulled handfuls of white hairs from his beard as he signed the treaty in impotent rage. His heart was broken, and he wearily held the helm of the state. He even lost his reason shortly before his death, and his son Ibrahim became vizir. He found Egypt a sterile waste, and he left it a powerful country, enriched with commerce, and strengthened by ships and armies. He died at Shoubra, near Cairo, on the 2nd August, 1849.

**MEHUL, ETIENNE HENRI**, the distinguished French musical composer, was born in 1763 of quite poor parents in the Ardennes. He was almost self-taught at first, but obtained the post of organist in his native village at the age of ten. Chance brought a clever organist into a convent in the neighbourhood, and Mehul managed to get entered as his pupil and deputy. Fortune again

favoured him with a patron who was struck by the lad's tasteful playing, and who took him to Paris. It is not necessary to trace minutely the steps of the industrious youth to fame. No trouble was too great, no labour too severe for him. He got an introduction to Gluck, who advised him, after careful consideration of his powers, to devote himself to the stage. He wrote several entire operas, in his thorough way, and then threw them aside, before he ventured to write one for public performance. When he did appear, however, he was at once successful, producing "Euphrosine et Coradin" in 1790, "Stratonice" in 1792, &c. Henceforth his fame was assured, and during the following seventeen years he produced twenty-four operas. His overture to "Le Jeune Henri," and an exquisite air from "Joseph" (1807), which is translated as "Ere infancy's bud had expanded," are prime favourites in England yet. Méhul was elected a member of the Institute in 1795, and received the Legion of Honour in 1802. He was associated with the great Conservatoire from its foundation. He died at Paris in 1817.

**MEIBOM, MARK**, who always styled himself in Latin fashion *Marcus Meibomius* (1626-1711), the famous authority on ancient music, was a native of Schleswig-Holstein. His great work, long the only accurate collection of genuine ancient Greek and Latin musical treatises, and still of importance, the "Antiquæ Musicæ Auctores Septem" (Seven Authors on the Music of the Ancients), appeared at Amsterdam from the Elzevir press in 1652, and was dedicated to Queen Christina of Sweden, then his patroness. Meibom taught afterwards at the University of Upsala in Denmark, and then at Utrecht, where he died. He visited England in 1674 with materials for a new edition of the Old Testament, but was not able to obtain publication.

**MEIN'NGEN**. See SAXE-MEININGEN.

**MEISSEN**, one of the most ancient towns of Germany, in the kingdom of Saxony, situated about 16 miles northwest from Dresden, on the left bank of the Elbe, over which there is a covered bridge. Meissen has numerous suburbs, and 14,166 inhabitants. The cathedral, the palace of Albrechtsburg, formerly the residence of the margraves of Meissen, until 1863 used as a porcelain factory—the royal porcelain manufactory, employing 650 hands, who produce what is known as Dresden china—and the former convent of St. Afra, are the chief buildings. The cathedral is the finest Gothic structure in Germany, and contains many monuments of very early times. There are also manufactures of hosiery, leather, colours, and camel's-hair brushes, but the principal source of profit is the making of wine.

**MEISTERSINGERS** (or Master-singers, Ger. *Die Meistersinger*), a body of burgher and artisan poets and musicians, who during the decline of the courtier MINNE-SINGERS revived the art of song and verse in a somewhat ruder guise than the lays of chivalry. These men, especially they of Nuremberg, who throughout the movement took the lead most distinctly, formed themselves at the beginning of the fourteenth century into a guild for music and poetry, very much akin to their craft guilds and merchant guilds; and just as these latter laid down among the rules dictated by common-sense many which seem the product of caprice, so also was it with the meistersingers' guild. Arbitrary limitations as to rhythm, construction, &c., abounded, and yet metre in the older sense of a definite number of feet in the verse, or in our newer sense of a definite number of syllables, was quite disregarded. The number of accents—that is, the rhythm—and the order of recurrence of the rhymes were, however, rigidly fixed for every kind of verse by him who invented it; and to gain the title of Master-singer it was necessary to produce a poem differing in some manner, in these respects of rhythm and rhyme schemes, from anything already done by the

guild. Many fantastic models were thus obtained. All, or nearly all, these poems were sung or chanted to simple recitative melodies, none of which are known to have been preserved. The separate forms or rhyme schemes were called *weisen* (styles), and were named after their inventor or after some fanciful title chosen by him. Thus we have Hans Tindeisen's "Rosemary Weise," Henry Frauenlob's "Yellow Weise," and his "Blue," his "Frog," and his "Looking-glass Weisen," &c. The best-known meistersinger is the shoemaker-poet Hans Sachs of Nuremberg (1494-1576), who figures largely in Wagner's opera-drama, "The Master-singers of Nuremberg," an excellent general representation of the main features of this curious movement. Müggeln and Frauenlob show more real poetical feeling than Sachs, though they are deficient to him in the amount of work done and in the far-fetched singularities of pedantic construction, of which Sachs was a consummate master. The principal meistersingers' works are well sketched in Edgar Taylor's "Lays of the Minnesingers and Master-singers" (London, 1823), Jacob Grimm's essay, "Über den Alt-deutschen Meistersängsang" (Berlin, 1811), is, like everything of his, of great value.

**MELACONITE**, *Black Oxide of Copper*, or *Tenorite* is sometimes worked as an ore. It is the cupric oxide ( $\text{CuO}$ ), and occurs mostly in a black powder or in botryoidal connections. In most instances it probably has been produced by alteration from copper pyrites. It has been noted as occurring in thin flexible scales in Vesuvian lavas. Its hardness is about 3, and specific gravity 6.25. It is found in small quantities associated with other ores in many copper districts; in larger quantities it has been found in the Lake Superior district and in the Mississippi valley.

**MELAGUET'S PEPPER**, or **GRAINS OF PARADISE**, are the seeds of *Amomum Melagueta*, a near ally of the ginger, and a native of west tropical Africa. The seeds are slightly aromatic and very pungent, burning in taste. The pungency is due to a resin. In Africa they are used like pepper, and are esteemed very wholesome. In this country they are employed to give an artificial strength to alcoholic liquors, and also in cattle medicines. In the fourteenth and fifteenth centuries they were used with cinnamon and ginger to flavour the spiced wine known as "Hippocras." There is a good coloured drawing and description of the plant in Bentley and Trimen's "Medicinal Plants."

**MELALEUCA**. See CAJUPUT.

**MEL'AM**. This substance is obtained as a residue on heating sulphocyanide of ammonium; it is purified by boiling it in strong solution of potash, from which it separates on cooling as a white granular powder. It is insoluble in water, alcohol, and ether. The formula is  $\text{C}_6\text{H}_{11}\text{N}_9$ . Long boiling with potash converts it into melamine ( $\text{C}_3\text{N}_3\text{H}_6$ ). By heat it is converted into mellons ( $\text{C}_6\text{N}_9\text{H}_{12}$ ). With dilute nitric acid it forms ammeline ( $\text{C}_3\text{N}_3\text{H}_8\text{O}$ ); with sulphuric acid ammelide ( $\text{C}_3\text{N}_3\text{H}_4\text{O}_2$ ) is obtained. Strong nitric acid converts it into cyanuric acid ( $\text{C}_3\text{N}_3\text{H}_2\text{O}_3$ ).

**MELANCHOLIA** (Gr. *melas*, black, and *cholê*, bile) is one of the forms of emotional insanity. In old writers it is used to designate monomania, but it now serves to describe a form of insanity which is characterized by great mental depression and misery. This unhappy condition is in some cases brought on by such causes as extreme sorrow, intense anxiety, or overwork, but sometimes no adequate physical or mental cause can be discovered. Beginning with a feeling of gloom, anxiety, and foreboding, the disorder advances until the patient becomes the prey of delusions all of which are of a distressing character. Sometimes these assume the form of physical evil, and the sufferer imagines he is afflicted with a fatal or loathsome disease; while in other cases the victim imagines he is over-

whelmed with debt, and that ruin in its most awful form is staring him in the face. Most commonly in England, however, the delusions are of a religious nature, and we see people who have lived devout and moral lives haunted by the dread of condemnation, and possessed by the notion that they are reprobates, or have committed the unpardonable sin. The bodily health soon gives way under the mental stress, the countenance becomes haggard and miserable looking, the digestion is disordered, the urine becomes loaded with lithates, there is obstinate constipation, and very often an aversion to food. In nearly all cases where the delusion becomes established there is a tendency towards suicide, and it is beyond question that a large proportion of those who die by their own hand are the victims of melancholia. In the majority of cases, however, the disease yields more readily to judicious treatment than almost any other form of insanity, and patients recover even at an advanced age or after some years of suffering. From the tendency to suicide and the injurious effect exercised upon this complaint by the sight of family, friends, &c., removal from home or asylum treatment is most desirable. The patient must be placed under careful supervision, and constant attention must be paid to the state of the digestive organs. As soon as these have been awakened into activity a full and nourishing diet should be given, and sleep should be assisted by the use of opium in some form that will not interfere with the digestion. As the body becomes better nourished its functions are performed with more ease and regularity, and the dark clouds of gloom are lightened and tend to pass away. There are, however, some forms of this disease in which recovery can hardly be expected; these are acute melancholia, in which the patients are frenzied with terror and exhaust their strength by their violence and excitement, and a form of the disease which is attended with stupor, and in which the sufferer passes into a state of dementia.

**MELANCHROITE** is a lead chromate, but differing from **CROCOISITE** in containing also oxide of lead; it has a specific gravity of about 5.7, and hardness slightly over 3. In colour it may be brick red, red, or on weathered surfaces yellow. It does not occur in sufficient quantity to be of importance as a lead ore.

**MELANCHTHON, PHILIP**, the eminent German scholar and reformer, was born at Bretten, a town of the Lower Palatinate, on 16th February, 1497. His father, George Schwartzerd, was an armourer, and his mother, Barbara Reuter, an affectionate and pious woman, was the daughter of the mayor of Bretten. The latter, John Reuter, undertook the charge of the education of Philip, who was sent to the College of Pfortzheim, where he attracted the notice of his kinsman, the famous scholar, John Reuchlin. The latter kindly extended to him his patronage, and Greekized his name Schwartzerd into Melanchthon, both words meaning *black earth*. After spending about two years at Pfortzheim, Melanchthon went to the University of Heidelberg, and thence to Tübingen, where he studied law, medicine, and theology, taking his doctor's degree in 1514. Soon after this he began to deliver public lectures on the classics and upon rhetoric and theology, drawing upon himself the attention of the scholars of Europe, from some of whom, and notably from Erasmus, he received high praise. In 1518, on the recommendation of his friend Reuchlin, he was appointed by the Elector of Saxony professor of Greek in the newly-established University of Wittenberg. His success was immediate and decided, and his appointment marks an epoch in German university education. His opening address was devoted to the reform of the curriculum, in which he summarily set aside the old scholastic methods of instruction, and very soon his class numbered no less than 1600 persons, including students from all parts of Europe. Luther also derived great benefit from his colleague in the prosecution of his Greek

studies, and received from him much help in the translation of the New Testament. Melanchthon appears to have been prepossessed in favour of the doctrines of Luther before he arrived at Wittenberg, and he soon decided to cast in his lot with the great reformer. In 1519 he was an eager spectator of the controversy at Leipzig between Dr. Eck, Carlstadt, and Luther, and being shortly afterwards assailed by Dr. Eck, he composed his first written contribution to the Reformation controversy in the shape of a treatise vindicating Luther's principle of the supreme authority of the Scriptures.

In 1520 Melanchthon married Catherine Krapp, the daughter of one of the burgomasters of Wittenberg, in whom he ever afterwards found a congenial and affectionate helpmate. In 1521 he published his "*Loci Communes Theologici*," a brief compact system of Protestant theology under fifty-three heads, expressed in terse and classic Latin. This work obtained great and immediate popularity, sixty editions being published during the author's lifetime: some of the later editions have some important modifications from his pen. After the first Diet of Spire (1526) Melanchthon was appointed one of twenty-eight commissioners deputed to visit the reformed states and regulate the constitution of the churches, and he published his "*Libellus Visitatorius*" as a directory for their use. In 1530 he was appointed by the general body of the reformers to draw up what was intended to be the conciliatory confession or exposition of their opinions, which was presented to the emperor at the diet held at Augsburg in March that year. There were still many who believed with Melanchthon in the possibility of a reconciliation of the contending parties, and during the next few years he attended the conferences which were held at Sinakald, Frankfurt, Worms, and Ratibon, with the view of settling the Reformation controversy by a compromise. As he was disposed to go as far as possible in the way of conciliation, he gave offence to the more extreme men on his own side, and in consequence became involved in controversies which caused him much anxiety. In 1546 Luther died, and Melanchthon, at the end of a friendship of twenty-seven years, pronounced the funeral oration. Being now in the front rank—a place for which he was constitutionally unfitted—troubles fell thick and fast upon him. In 1548 he gave a qualified adhesion to the system of compromise issued under the authority of the emperor, afterwards known as the "Interim," and this made him a mark for the assaults of the more extreme champions of Protestantism. He was not, like Luther, made of the stern stuff which finds pleasure in the fray, and the clamour of his enemies made him weary of life. In 1557 he held his last public discussion with Roman Catholic opponents at Worms, and soon afterwards his health failed, and after a period of increasing weakness, he died 19th April, 1560. His remains were interred beside those of Luther.

Melanchthon was a man of an emotional temperament and of a gentle and conciliatory disposition. He had eminent gifts as a teacher, and his deep and wide learning, clear thought, and ready pen made him pre-eminently the scholar and scribe of the Reformation. He found a congenial place by the side of Luther, whom he was able to assist with counsel and advice, and whose strong, rough nature seemed to be the complement of his own. Withal he was a man of deep and earnest piety, his conduct furnishing a beautiful exemplification of his teaching.

His numerous works, consisting of theological treatises, controversial pamphlets, commentaries on several of the Greek and Latin classics, commentaries on Scripture, Latin poems, and some historical and philosophical writings, were published in a collected form in five vols. folio at Basel in 1544, and in four vols. folio at Wittenberg in 1564, again in 1580, and again in 1601. The best edition, how-

ever, and one which includes an immense academic correspondence and letters to some of the leading men of the age, is that contained in the "Corpus Reformatorum," edited by Bretschneider and Bindseil (twenty-eight vols., Brunswick and Halle, 1834-60). His life was written by his friend Camerarius (1566), and several biographies have appeared since. Among the latest of these is that by Schmidt, "Melancthon's Leben" (1864). His name has always been held in high honour among Protestants, and the tercentenary of his death was celebrated with great solemnity throughout Germany in 1860.

**MEL'ANITE** (Gr. *melas*, black) is a dark iron-lime GARNET that occurs usually associated with the leucite group of minerals. It contains oxide of manganese ( $MnO$ ), and is found in the Pyrenees and in Norway, also in the lavas of Vesuvius near Rome.

**MEL'ANORRHŒA**, a genus of the order ANACARDIACEÆ. *Melanorrhœa usitata* is familiarly known as the Burmese Varnish Tree. The tribe to which it belongs abounds in plants yielding a blackish, acrid, and resinous juice, used for varnishing and similar purposes, as the Marking Nut and the Japan Varnish Tree. The name of this genus is derived from the Greek words *melas*, black, and *rhêô*, to flow.

The Varnish Tree, or Theetsee, forms a large tree, with the habit of *Semecarpus*, and abounds in every part with a viscid ferruginous juice, which quickly becomes black by the contact of the atmosphere. The varnish is collected by inserting pointed joints of bamboo, which are closed at the other end, into wounds made in the trunk and principal boughs. The joints of the bamboo are removed after from twenty-four to forty-eight hours, and their contents, which rarely exceed a quarter of an ounce, emptied into a basket made of bamboo and rattan previously varnished over. In Burma almost every article of household furniture intended to contain either solid or liquid food is lacquered by means of this varnish. It is also much employed in the process of gilding; the surface, being first besmeared with this varnish, has then the gold leaf immediately applied to it. The beautiful Pali writing of the Burmese on ivory, palm-leaves, or metal, is entirely done with this varnish in its native and pure state.

In this genus there are five sepals, cohering into a pointed cap, which falls off as the flower opens. There are five to eight petals, which enlarge as the fruit ripens; and five or several stamens inserted all over the disc. The ovary is stalked, with a single ovule.

**MEL'ANOSPER' MEE** (Gr., black seed), an important class of ALGÆ, consisting of olive-coloured seaweeds, and including the following orders:—Fucaceæ, Sporochinaceæ, Laminariaceæ, Dictyotaceæ, Chordariaceæ, and Ectocarpaceæ. To the first order belong *Fucus* (bladderwrack) and *Sargassum* (gulf-weed); their spores are contained in globular hollows in the frond. The second order contains *Desmarestia* and *Sporochorus*, and two other genera; their spores are attached to external, jointed filaments, either free or compacted into knobs. Laminariaceæ contain, among others, the common tangle (*Laminaria*); the spores are on the outside, in patches or covering the whole frond. The Dictyotaceæ have also the spores on the surface, but they are arranged in definite spots or lines; to this order belongs the beautiful Peacock's Tail (*Padina pavonia*). The orders already mentioned are not jointed, and are very distinct from the Chordariaceæ, in which the fronds are gelatinous or cartilaginous, composed of interlacing vertical and horizontal filaments, and from the Ectocarpaceæ, which have jointed filaments.

**MELANTERITE** (from Gr. *melas*, black) is the hydrated sulphate of iron ( $FeSO_4 \cdot 7H_2O$ ) as it occurs in nature. The commercial article, which is prepared artificially, but has the same composition, is generally known as *Copperas*.

Melanterite, though occurring naturally, is almost always a secondary product derived from the oxidation of pyrites ( $FeS_2$ ); it is soluble in water, and the solution turns black on the addition of tincture of nut-galls, hence its name. The salt of commerce—copperas or green vitriol—is much used by tanners, dyers, and ink manufacturers; with ferrocyanide of potash (yellow prussiate of potash) it yields the pigment *prussian blue*. From this salt—sulphate of iron—the alchemists of old obtained their oil of vitriol. By heating it in a retort the sulphuric acid is evolved, the base oxide of iron forming the solid residue.

**MELA'PHYRE** is an igneous rock, generally found intruded or interstratified sheets. In a petrological sense melaphyre is an ancient lava or basalt; it is basic in character, has become greatly altered, and there are generally many secondary products formed. It usually consists of plagioclase felspar and augite, with olivine, which is generally more or less altered; magnetite, titanite, and pyrites, the latter usually in a decomposed state, are also to be detected in small quantities. The term melaphyre is variously used by different authors, but although they do not agree as to its mineral constituents, yet most apply the term to a basic igneous rock of Palæozoic age, deficient in highly crystalline structure.

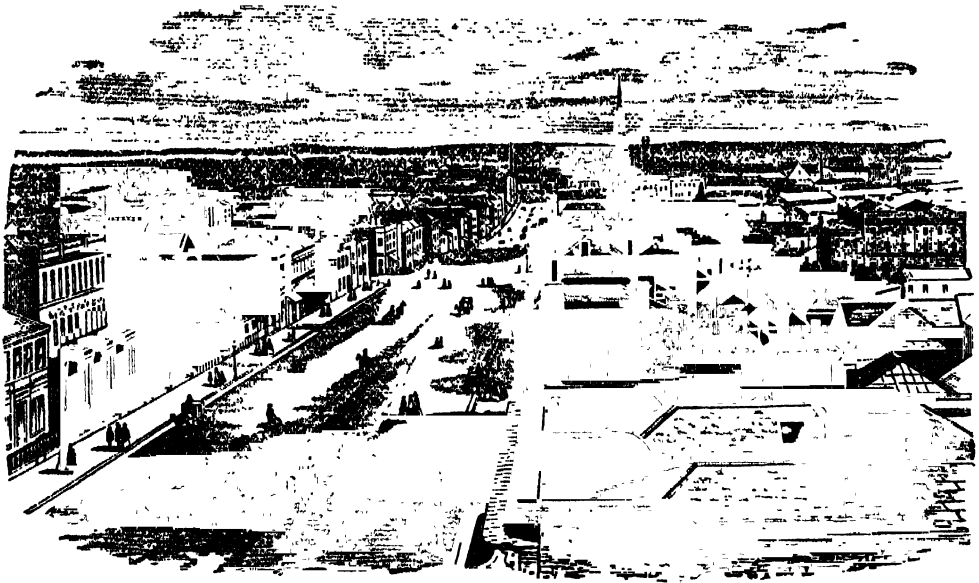
**MELAS'TOMA'CEÆ**, an extensive order of plants belonging to the POLYPERALÆ (cohort Myrtales). The species are extremely numerous in tropical countries, especially South America, where they usually form bushes or small trees, and are scarcely known beyond the tropics, with the exception of some *Rhexias*, which straggle into North America. In Europe the order is unknown, unless in gardens, where many species are cultivated for the sake of their gay purple or white flowers. The name (Greek *melas*, black, and *stoma*, mouth) is derived from the fact that the berries of some species when eaten stain the mouth black. The species are myrtle-like plants, the leaves are opposite, with curved ribs running from the base to the apex. The stamens have beaked anthers, shedding the pollen by pores at the apex. The seeds are numerous, minute, without albumen.

**MEL'BOURNE**, the metropolis and seat of government of the colony of Victoria in Australia, is situated on the north bank of the river Yarra-Yarra, in the county of Bourke, on the northern bend of the bay of Port Philip, about 500 miles south-west of Sydney. The town was officially founded and named from the then English prime minister in 1837, but the site had been occupied two years previously. It was made the head of a bishopric in 1847. When it is considered that the city is only about fifty years old, it stands almost alone in the rapidity of its growth and development from a habitation of savages to the position of one of the chief cities of the British Empire. It abounds in edifices which rival those of the older capitals of Europe, and which, though of recent and rapid construction, are as substantial and enduring as are those of any place in the world—the material, bluestone, of which most of the warehouses and many of the public buildings are in whole or in part constructed, being, so to speak, of an imperishable nature.

From the sea Melbourne does not present a very handsome appearance, as the shore land is low, and chiefly occupied by the seafaring population and factories and wharves. The city proper, however, further inland, is built on several hills, which afford magnificent sites for the numerous fine buildings with which it is a lorned, conspicuous among which is the Government House, a palatial building, with a square tower 145 feet high, from whose summit a magnificent panorama of land and sea is obtainable. Its beauty is increased by the regularity and breadth of the principal streets, which are generally about a mile in length and 99 feet in width, in many cases planted with trees, and all at right angles to each other;

these are intersected by smaller streets which bear the name of the larger streets with the prefix "Little." The public and government buildings exceed, perhaps, those of any other city of the same size in any part of the world; and parks, gardens, and places of recreation are abundant. The most noteworthy edifices are the Treasury, Houses of Parliament, with a library of 85,000 volumes; the new law courts, free library, containing 112,000 volumes, and a picture and statuary gallery; post-office, government printing offices, and government offices; the custom-house, near the spot where Fawkner moored the little craft that was the pioneer of the fleets of merchantmen that have since ploughed the waters of Hobson's Bay; the mint, university, with the admirable museum attached, and its hall; the Presbyterian college; the town-hall, with one of the largest and finest organs in the world, having seventy-nine stops and 4378 pipes; the new Congregational hall; the exchange; the Bank of Australia, the London Chartered Bank, the Bank of Victoria, and the Oriental and the Colonial Banks; and the Exhibition buildings of 1880.

The places of worship are numerous, the most noteworthy being the Scotch church, with a graceful and elegantly proportioned steeple 211 feet in height; the Roman Catholic cathedral, the Church of England cathedral, and the Wesleyan, Independent, and Baptist churches. There are two principal railway stations. Among the institutions of Melbourne may be mentioned the Observatory, provided with appliances of the first order, and with a telescope ranking among the largest now in use; a mechanics' institute, a commodious hospital, a university, benevolent asylum for aged and infirm, orphan asylum, immigrants' home, lunatic asylum, blind asylum, lying-in hospital, Alfred Hospital, and children's hospital. There are four theatres and a first-class racetrack. The parks and gardens comprise the Studley, Royal, and Fawkner Parks, and Fitzroy (area, 70 acres), Carlton, and the Botanical Gardens (area, 100 acres). The port of Melbourne is at Sandridge, a township  $2\frac{1}{2}$  miles distant, situated on Hobson's Bay, and connected with the metropolis by road and railway. Sandridge has two large and commodious piers,



Melbourne.

jutting out a long way into the bay, affording accommodation for a large fleet, and allowing vessels of almost any tonnage to berth along side. There is also access for steamers and vessels of considerable size to the very heart of the city by means of the river Yarra-Yarra, which is navigable to Melbourne and no further, being then impeded by a dyke of basaltic rock known as the Falls. There is a large graving dock at Williamstown, but there is little shipbuilding carried on. There are a large number of factories at work, and the chief industries are the manufacture of clothing, woollens, preserved meats, preserved fruits, ironwork, boots, carriages, and leather. The value of land is very great within the city boundaries and rent very high, but clothes and food are cheap. The river is crossed by several bridges. Melbourne is divided for municipal purposes into seven wards, each having an alderman and three councillors. The population of the city proper in 1881 was 65,860; of the ten mile radius, 280,836. The mean temperature of the year at Melbourne is 57°, in summer 66°, and in winter 49° Fahr. St. Kilda and

Brighton are marine appendages of the capital, on the shore of Port Philip, visited for sea air and bathing.

**MELCHIADES**, Pope from 312 to 314, was Bishop of Rome at the time of the conversion of Constantine the Great. But it was Silvester, his successor in the chair of St. Peter, who knew how to turn that illustrious conversion to the glory and profit of the church.

**MELEAGROS** (Lat. *Meleager*), a personage of the Greek mythology, was fabled to be the son of Althea (Lat. *Althea*). His father is said to be the god Ares by some poets, the king Oineus by others. The great legend in which Meleagros figures is the hunting of the boar of Caludôn (Lat. *Calydon*). This was an ancient town of Aitolia, the mountainous region on the north shore of the entrance to the Gulf of Corinth in Greece. The king neglected to sacrifice to Artemis, and the offended goddess sent a fearful wild animal, somewhat like a monstrous boar, which laid waste the country. Meleagros assembled a body of picked hunters and went out against the monster on his arrival from taking part in the expedition of the



Argonauts; he was successful in killing him. A dispute arose over the skin, which the votaries of two separate temples wished to dedicate to the gods. Frequent contests ensued. Meleagros was unfortunate enough to kill his mother's brother, and Althæa in her fury cursed him. He fought no more, till the insurgents came against the chief town itself, and his mother begged him to forget her curse. He arose at last, at the prayer of his wife, and routed the enemy, but the Furies, who had registered his mother's words, took away his life as he returned. This ancient legend was much elaborated by later poets. In its complete condition we find Althæa lying in the palace with her newborn babe, warned by the Fates that the life of the boy is decreed to last no longer than the brand now burning in the hearth. Whereupon the fond mother plucks it from the fire, extinguishes it, and locks it away in a chest. Meleagros grew up, became famous as a hunter and warrior, went on the Argonautic expedition, and returned to find the boar ravaging Kaludôn, as before told. But in the enlarged tale he does not at once go out to slay it. He assembles a number of the princes of Greece, and with them came also the fair huntress Atalanta, who loved Meleagros and was beloved by him. The princes at first declined to hunt with her, but after all it was she who first wounded the boar. Meleagros killed it, and gave Atalanta the hide. His uncles snatched it away and he killed them. Althæa solemnly took from the chest the half-burnt brand, plunged it in the fire, and Meleagros perished. His sisters and his wife died of grief. As soon as she realized the horrors of her crime Althæa put an end to her life.

**MELENE** is the paraffin of bees-wax, from which it is obtained by distillation. It crystallizes in white shining scales. It has a specific gravity of 0.89. It melts at 62° C. (148° Fahr.), and boils about 370° C. (698° Fahr.) It is insoluble in water and alcohol, but very soluble in ether and the oils. The formula is  $C_{30}H_{60}$ . It is not acted on either by strong acids or alkalies.

**MELEZTTOSE**, a sugar obtained from the manna of Briançon. It crystallizes in small shining crystals, which melt at 140° C. (284° Fahr.) It is very sweet, dextro-rotatory, and fermentable. It is insoluble in alcohol and ether; the formula is  $C_{12}H_{22}O_{11}$ . Boiling dilute sulphuric acid converts it into glucose.

**MELIA**, a genus of plants belonging to the order MELIACEÆ, to which it has given its name. The species are few, and chiefly Indian; one is naturalized in the south of Europe, and one is found in North America. The bark of the Neim or Margosa Tree (*Melia Azadirachta*) is bitter and considered a valuable tonic. The leaves are used in the form of a poultice as a local stimulant, and is found of value for application in skin diseases and small-pox. The fruit yields an oil, which is applied externally for rheumatism, and is also used for burning. *Melia Azedarach* (the Pride of India, or common Bead-tree) is a native of China and the north of India. It is much cultivated in the southern United States of North America. Its flowers resemble those of the lilac, and are very fragrant. A decoction of the bark of the root acts as an emetic and cathartic, and is also considered a good-anthelmintic.

**MELIACEÆ**, an order of plants belonging to the POLYPTALÆ (cohort Geraniales), consisting of trees or shrubs, inhabiting all countries within the tropics, but very rare in colder climates—the *Melia Azedarach*, or bead-tree, a Syrian plant now naturalized in the south of Europe, forming the principal exception. In general the species are bitter and astringent, but they are sometimes dangerously poisonous, acting violently as emetics and purgatives. *Suietonia Mahogani* is the mahogany tree. Its bark and that of species of *Cedrela* are used in Central America as substitutes for cinchona. The stamens in this order are double as many as the sepals or petals, and are coherent into a tube, except in the tribe Cedreleæ.

The ovary is free, with few or many cells, and a single style. The seeds are winged in the Cedreleæ.

**MELILOTUS**, a genus of plants belonging to the order LEGUMINOSÆ. None of the species are ornamental plants, and they are seldom cultivated except in botanical collections. *Melilotus officinalis*, found native in Great Britain, has long roots, a branching stem 2 or 3 feet high, and yellow flowers in lateral racemes. It grows wild in woods, hedges, and neglected fields. When cultivated in a dry soil and made into hay, it has a powerful aromatic smell, and mixed in a small proportion with meadow-hay gives it an agreeable flavour.

**MELIPHA GIDÆ**. See HONEY-EATER.

**MELITOSE**, a sugar obtained from the manna of several species of Eucalyptus. It crystallizes in colourless needles, which are very soluble in boiling alcohol. The aqueous solution is laevo-rotatory. The formula is  $C_{12}H_{22}O_{11} \cdot 8H_2O$ , the crystals containing three equivalents of combined water; on heating to 130° C. (266° Fahr.) these become anhydrous. Treatment with boiling dilute sulphuric acid converts it into glucose and eucalyu ( $C_6H_{12}O_6$ ). This is also the first result of fermentation.

**MELKARTH**, a god of the Phœnicians identified by an ancient inscription in Malta (originally one of their colonies) with the Greek Hēraklēs. He had a superl temple in Tyre. The pillars or tablets of MelkARTH, or in the Greek spelling *Melikertes*, are often spoken of in ancient records, and are the "Pillars of Hēraklēs" (Hercules), that is, the Straits of Gibraltar. This, however, was a confusion of the Greeks; the real "pillars of MelkARTH" were small votive tablets suspended by the hero-god, and preserved in his temple at Phœnician Gaddir (the modern Cadiz).

**MELKS' HAM**, a market-town of England, in the county of Wilts, 7 miles west by north from Devizes, 26 miles north-west from Salisbury, and 96 from London by the Great Western Railway, consists principally of one irregular street, nearly a mile in length, on the road from Bath to Devizes and on that to Westbury. The principal part of the town is divided by the Bristol Avon, over which is thrown a stone bridge of four arches, from a suburb called the City. The houses, mostly of stone, are of neat appearance, and the main street is paved and well kept. The church, a cruciform building, has some portions of Norman architecture, a handsome central tower, and two chantry chapels on the south side. The town-house is a semi-classical edifice; the town also contains four dissenting chapels and the usual local charities. Over some mineral springs in the neighbourhood suitable baths have been erected. Some large corn-mills are fed by the river, and the manufactures of hair-cloth, cocoa-nut matting, ropes and sackings are still considerable, although not so extensive as formerly. The population in 1881 was 2178.

**MELLITIC ACID**. This acid is found in mellite or honeystone, the only source in which it occurs, in combination with aluminium. It is extracted by boiling with carbonate of ammonia as mellitate of ammonium; this is converted into mellitate of lead, from which the acid is set free by sulphuretted hydrogen. It is a white crystalline powder, having the formula  $C_6H_2O_4$ . It is soluble in water and alcohol. It fuses on heating, and decomposes, forming a crystalline sublimate, pyromellitic acid ( $C_6H_2O_3$ ).

Mellitic acid is dibasic, and forms two series of salts called mellitates. The mellitate of aluminium is found native as honeystone. It also forms two ethers.

**MELLITUS**, the first Bishop of London, and the third Archbishop of Canterbury, was sent to England by Pope Gregory the Great. He converted the East Saxons in 604, and became bishop of London. He was a delegate to Rome in 610. Some disturbances among the heathen at the death of King Ethelbert drove him from his see in 616, and he fled for refuge into France, but in 619 he was elected successor to Laurentius as archbishop of Canterbury.



**MEL'LONE** or **TRICYANU'RAMIDE**, a substance obtained from many of the cyanogen compounds by the action of heat, as noticed under **MELAM**. It is a light-yellow powder, having the formula  $C_3N_3H_3$ . When heated, it splits up into nitrogen and cyanogen. Heated with potassium, or with potassium iodide, it forms mellonide of potassium ( $C_3N_3K_3$ ), from which hydromellonic acid ( $C_3N_3H_3$ ) may be obtained in solution. This acid forms a large number of salts called mellonides.

**MEL'ODY**, in music, is a term of very wide significance; indeed the greatest authority of our time, Sir George Macfarren, describes it simply as "notes in succession," clearly distinguished from harmony therefore, which consists of notes in combination. Any chance succession of notes makes a melody, however short; but for the special class of melodies called *tunes* or *airs*, a certain definite rhythm is required, a certain grouping of accents and phrases, closely akin to the metre of poetry.

There is a fundamental distinction between the principal earlier melodies and those of to-day; the former were thought out by themselves, and many of them bear harmonizing very ill indeed, whereas we in our time always think of a melody as one part of a series of harmonies. These harmonies grow ever more and more complex, and the inner relations of the melodies therefore grow harder and harder to seize as time goes on, which explains why in comparing notes about an original composer's new work, it is so usual to find the listeners sharply divided into two classes, the one declaring that there is not a melody in it, and the other that melodies never cease from its beginning to its end. The first class really narrow the wide term melody to mean a tune of the more rigidly formal type.

**MELO'IDÆ** is a family of beetles belonging to the group Trachelida, and the suborder Heteromera. This family, which contains the English oil-beetles, is of great interest from the parasitic habits of the larvæ and from the number of changes of form which they undergo before reaching maturity. In the Meloidæ the body is soft, cylindrical, and slender. The hind wings are frequently absent, and the elytra are often very short, and overlap one another at the base of the suture. The legs are long and the antennæ composed of eleven joints. The perfect insects are found on flowers. The larvæ are very minute, and being parasitic on bees and flies were formerly mistaken for lice. They pass through more than the ordinary stages in attaining maturity, exhibiting what has been called *hypermetamorphosis*. This subject has been carefully investigated by M. Fabre. The species of the genus *Meloe* or oil-beetles, dark-blue beetles with short elytra overlapping one another on the broad abdomen, lay their eggs in the early spring in holes in the ground near the nests of bees. The larvæ, which have a long flattened body, six long legs provided with claws, and short antennæ, attach themselves when hatched to the bodies of bees, by whom they are carried into the nests and enabled to prey on the grubs and bee-bread. According to M. Fabre the larva, soon after entering the nest of the bee, changes into a fleshy motionless grub with aborted feet and without movable appendages to the head; and a third larval form is assumed before the insect becomes a pupa. The life-history of *Sitaris muralis*, a species of this family found in Europe and in this country, is very similar. Its eggs are laid near the cells of the mason bee, and the larva is carried in on the bee's body. The mother bee lays an egg in a honey cell, whereupon the tiny parasite drops off on to the egg, being careful to avoid rolling into the liquid honey. When in the course of days it has devoured the contents of the egg, it changes into a white cylindrical nearly footless grub, and rolls off the egg-shell into the honey, on which it feeds. Another change of form occurs, in which stage it remains motionless till spring, when a form similar to the second larval form is assumed. But it takes no food and shortly

changes into an ordinary pupa, which becomes the winged insect. The whole series of these changes occupies two years.

**MEL'ON** (*Cucumis Melo*) is an herbaceous, succulent, climbing or trailing annual, a native of India, but cultivated for its fruit in hot Eastern countries from time immemorial, and first introduced into England about 1570. Its original English name was *Musk Melon*. In regions where most cooling vegetables disappear on the approach of great summer heat and drought, the melon, together with the water-melon, become essential substitutes.

If the roots be favourably situated, so far as moisture is concerned, the melon will bear a tropical heat; and, generally speaking, it will not succeed perfectly in the open air beyond the forty-third parallel of latitude. Its range of atmospheric temperature may be estimated at between 70° and 80°.

Light is so essential that unless the plants are kept near the glass no tolerable degree of flavour will be acquired. As much of the direct rays of the sun should be admitted as the plants will endure, more especially when the fruit is approaching maturity. A free admission of the air is also to be recommended, so far as is consistent with the maintenance of a high temperature. The regulation of moisture in the artificial atmosphere in which melons are grown under an English sky is, of all others, the greatest difficulty. Covering the soil with slates or tiles, or with clean gravel, has been successfully resorted to as a mode of preventing the air in the frame from being at all times saturated with moisture exhaled from the soil.

**MEL'OS**, the ancient name of the present **MIL**, one of the Cyclades Islands. In 416 B.C., after a long siege, the Athenians took it, and massacred every man in the place, taking the women and children into slavery, and reoccupying the island with an Athenian colony.

**MELPOM'ENE**, one of the **MUSES**; she presided over tragedy. The name Melpomené means the singing goddess, tragedy being in its origin the sacred action-songs devoted to the festivals of the god Dionysos.

**MELROSE**, a burgh of barony of Scotland, in the county of Roxburgh, beautifully situated at the north foot of the Eildon Hills, on the Tweed, 35 miles south-east of Edinburgh by road and 37 by rail. The town, which is very ancient and was formerly known as *Fordel*, has revived since Sir Walter Scott's residence at Abbotsford, 3 miles distant, attracted attention, and now consists chiefly of three main streets branching off from the market-place, in the centre of which there is a cross dated 1642. In the suburbs which have sprung up around there are numerous private villas. It has a parish church, a Free church, a United Presbyterian church, Congregational and Episcopal church, a corn exchange and a public hall. The town was formerly noted for a material called Melrose land linen, but the industry is extinct. The population of the parish in 1881 was 11,131; of the town 1550.

The chief glory of Melrose is the possession of the finest monastic ruin in Scotland. The Abbey of Melrose, originally founded by David I., in 1136, for Cistercian monks, was destroyed by the English forces, under Edward II., in 1322. The structure, of which the mutilated remains still attest its former grandeur and magnificence, was restored by Robert Bruce, the hero of Bannockburn, in 1326. It was here that he desired that his heart should be buried. The abbey was burnt in 1885 by order of Richard II. It suffered much in the numerous border conflicts, and was not finally completed until the reign of James IV., and must, when entire, have been one of the noblest structures of the kind in the kingdom. It is probable that at the time of the Reformation it had already suffered during the conflicts of Edward VI.'s reign, and that from that time its neglect led to its gradual and total ruin, until its stones became the principal building material of the vicinity. In

fact, with the exception of a part of the cloister walls, the abbey has been wholly destroyed; but fortunately a considerable part of the church has been preserved. The great altar or eastern window, 86 feet in height by 16 feet in width, is unrivalled for its fine proportions, the richness of its tracery, and the beauty and delicacy of its workmanship. It has been admirably described by Scott:—

"The moon on the east oriel shone,  
Through slender shafts of shapely stone,  
By foliated tracery combined;  
Then would'st have thought some fairy hand  
'Twixt poplars straight the osier wand  
In many a freakish knot had twined;  
Then framed a spell when work was done,  
And changed the willow-wreath to stone."  
—"Minstrel," canto ii. st. 11.

The south transept window and door is, perhaps, the most perfect part of the ruin. It is in the Decorated style, with crockets and creeping foliage. The compartment of the nave, from the screen work to the cross, was roofed over, and fitted up, in 1618, for the parish church. But this roof does not harmonize with the rest of the fabric; and it is obvious that the stones of which it consists had been quarried from other parts of the building! A great tower rose from the centre of the cross, of which a portion, 84 feet in height, still remains; but the spire by which it was surmounted is entirely gone. The decorated work and masonry of the building have been most admirably executed; the mouldings are still as sharp as if they were fresh from the chisel.

**MELTON-MOWBRAY**, a town of England, in the county of and 14 miles north-east from Leicester, and 113 miles from London by rail, situated in a valley on the river Eye, near its junction with the navigable Wreak, over which are two bridges. The population in 1881 was 5766. The church was thoroughly restored in 1867, and there are besides several dissenting places of worship; a corn exchange, mechanics' institute, museum, grammar-school, and almshouses. A cattle-market was opened in 1871. The well-known Melton Hunt is a considerable source of profit to the town; there is stabling here in connection with it for 800 horses. Pork pies and Stilton cheese are extensively made in the town. The town was anciently called *Mædeltone*.

**MELUN**, the ancient *Melodunum*, capital of the French department of Seine-et-Marne, is situated on the Troyes Railway, 26 miles S.E. of Paris, and has 9824 inhabitants. It has manufactures of woollen stuffs, printed calicoes, leather, bricks, tiles, and cement. It is built on an island and on both banks of the river Seine, the largest quarter standing on a slope on the right bank, and the three parts being united by two bridges. It is on the whole well built; the banks of the river are lined with quays, and several promenades have been formed. The church of St. Aspais, on the right bank of the Seine; the church of Notre Dame, on the island; the monastery of St. Père, the Carmelite convent, now converted into a court-house, a prison, a guard-house, and theatre; the old monastery of La Maison-des-Frères, and the central prison—are the chief structures in the town. Melun has a good trade in corn, flour, wool, and cattle. It was besieged and taken by the English in 1419.

**MELVILLE, ANDREW**, a distinguished Scottish reformer and scholar, the youngest of nine sons of Richard Melville of Baldovry, near Montrose, was born 1st August, 1545. When he was only two years old his father fell at Pinkie, and his mother died soon after. But his elder brother Richard and his wife took an affectionate charge of the orphan, and he never forgot their kindness. His brother endeavoured to give him the best education possible in Scotland, and he was sent to the grammar-school of Montrose and afterwards to St. Mary's College, in the University of St. Andrews. Having finished his course of

study he left St. Andrews with the reputation of being "the best philosopher, poet, and Grecian of any young master," and studied two years in the University of Paris. In 1566 he entered the University of Poitiers, and when only twenty-one years of age was made a regent in the College of St. Marceon. Driven from thence by the civil war, he made his way in a state of destitution to Geneva, where he obtained through Beza the chair of humanity in its academy. He returned to Scotland in 1574, and shortly afterwards was appointed by the General Assembly principal of Glasgow College, which then was in a deserted and almost ruined condition. His zeal, diligence, and fame as a scholar soon raised the fortune of the dilapidated college, and its literary history properly commences with his principality. While holding that office he composed his "*Carmen Mosis*" (a Latin paraphrase of Deuteronomy xxxii.), which has been justly admired for the fire and force of its lines; but though distinguished as a scholar, he exercised his greatest influence in connection with the ecclesiastical politics of the period. As minister of Govan he sat in the General Assembly, and accomplished more than any other man in Scotland towards the maintenance of Presbyterianism. In 1580 he was translated from Glasgow to be principal of St. Mary's College in the University of St. Andrews, where he distinguished himself by his usual zeal and ability. Being called upon to open an extraordinary meeting of the General Assembly in 1582, he censured with great severity the tyrannical measures of the court, and afterwards headed a deputation sent to carry a remonstrance to the king. In 1584 he was cited before the Privy Council, and condemned to imprisonment; but his friends, believing that the court meant to kill him, prevailed on him to escape to England, where he remained until after the fall of Arran, when he returned to Scotland and resumed his old office at St. Andrews. During the next few years he continued to offer the stoutest resistance to all attempts to impose Episcopacy upon Scotland. In 1605, in defiance of the royal proclamation, he called a General Assembly at Aberdeen, and the following year he was summoned with some other ministers to meet the king at Hampton Court. He had several interviews with James, and at last, having in the interim ridiculed the service in the chapel-royal in a Latin epigram, he was summoned before the Privy Council. Before this august tribunal his temper gave way, and he inveighed so fiercely against the Archbishop of Canterbury and the rites, &c., of the English Church, that, in defiance of the law, the king sent him to the Tower, where he remained four years. In 1611 he was released on the solicitation of the Duke of Bouillon, who required his services as a professor in the University of Sedan, where he died in 1622.

Melville was a man of immense energy and force of character, and one who would never move a hair's breadth out of the path of duty. Many anecdotes have been preserved showing his fearless independence, one of which may be mentioned here. Taking offence at some of the actions of the ministers, the Regent Morton sent for Melville and sought to intimidate him, saying, "There will never be quietness in the country till half-a-dozen of you be hanged or banished." "Fush, man," answered Melville, "threaten your courtiers after that fashion; it is the same to me whether I rot in the air or in the ground, and I have lived out of your country ten years as well as most."

In connection with the universities of Scotland he effected the most important improvements, and had a chief share in the revival of the study of classical literature, while as a reformer he can be ranked next only to Knox himself.

**MELVILLE ISLAND** is situated on the northern coast of Australia, between 11° and 12° S. lat., and 130° 20' and 131° 84' E. lon. The area is about 1800 square miles. It is separated from Bathurst Island, which lies west of it, by Apsley Strait, 46 miles long by 8 broad. East of the island lies Coburg Peninsula, and between them lies

Dundas Strait, 15 miles wide. The eastern end of Melville Island is only 15 miles from the mainland of Australia. The northern line of coast, and also the western, along Apsley Strait, where alligators abound, are low, intersected by swamps, and covered by impenetrable woods of mangroves. The interior is more elevated, and has an undulating surface. The island is well clothed with wood, and presents one mass of thick green foliage. Water is easily obtained by sinking wells. The natural vegetation is luxuriant, but the soil is not generally good for farming. There are several species of eucalyptus. The zoology of the island is very varied. The native inhabitants are of the Australian stock, but somewhat more intelligent.

**MEMBRACIDÆ** is a family of insects belonging to the suborder HOMOPTERA, order HEMIPTERA, and finding its nearest allies in the Frog-hoppers or Cuckoo-spits (Cercopidae). The insects included in this family are among the most extraordinary as regards external appearance. The prothorax is enlarged and produced into processes of the most various shapes, sometimes, as in the species figured, *Bocydium globulare*, being produced into a number



Bocydium globulare.

Eda inflata.

of little knobs, with a long straight process extending parallel to the back. The head is bent down, the antennæ are short, and composed of three joints, and two ocelli are present. The wings are membranous.

The species of this family are chiefly inhabitants of America, but a few occur in Europe and the British Isles. *Centratulus cornutus*, a species common in the New Forest, is about a quarter of an inch in length; the prothorax forms a long, jointed, curved, and keeled process over the back, while above the thorax it sends out two sharp horns. Some Brazilian forms, as the species figured, *Eda inflata*, have curiously inflated appendages over them, which quite conceal the rest of the insect.

**MEMBRANE**, a name given to different thin organs, representing a species of supple, more or less elastic web, varying in structure and vital properties, and intended in general to absorb or secrete certain fluids, and to separate, envelop, and form other organs. Membranes are either simple or compound. Simple membranes comprise three orders:—

1. *Mucous membrane* is so called on account of the mucous fluid by which it is constantly lubricated. Mucous membranes line the canals, cavities, and hollow organs, which communicate externally by different apertures on the skin. The mucous membranes have a striking analogy to the cutaneous tissue, in organization, functions, and diseases. They are composed of corium, papillæ, and epidermis, and are furnished with a multitude of follicles, which secrete a viscid humour—mucus. They receive a quantity of arterial vessels, veins, lymphatics, and nerves.

2. The *serous membranes* are thin, transparent, and composed of one lamina. One surface adheres to other tissues; the other is smooth, polished, and moistened by a serous fluid. They are arranged in the form of sacs without apertures, as great intermediate reservoirs for the ex-

halant and absorbent systems, in which the serous fluid in passing from one system carries some time before it enters the other. The serous membranes resemble the areolar membrane in structure and diseases. They facilitate the motion on each other of the organs which they envelop.

3. *Fibrous Membranes*.—These are almost all continuous, and terminate at the periosteum, their common centre. They are not free or moistened by any particular fluid. They adhere by both surfaces to the adjoining parts; they are firm, resisting, but slightly elastic, and of a white colour, sometimes pearly and glistening. Their vessels are numerous in some, as in the dura mater and periosteum; in others scarcely perceptible, as in the aponeuroses. The presence of nerves has never been proved in them, although several circumstances regarding their sensibility render their existence probable. The fibrous membranes serve in general to augment the solidity of the organs which they envelop, to retain the muscles in their respective positions, to favour the motions of the limbs and that of the muscles and skin, and to form canals and rings for the passage of different organs.

*Compound membranes* are those which partake of the characters of two species, such as the gall-bladder, which has both a serous and a mucous lamina at its lower part, and the dura mater, which has both a serous and a fibrous lamina, &c.

**MEMEL**, the most northerly town of Germany, situated at the junction of the Dange with the Baltic, in the north part of the Kurische-Haff, 72 miles N.N.E. from Königsberg. It is inclosed and defended by old bastioned walls, and has a citadel. It consists of the old, the new, and Frederick's Town, and their suburbs. The harbour is commodious, safe, and deep, and has a lighthouse 128 feet high. It largely exports oak-planks, fir, and other timber, corn, flax, hemp, hides, bones, wool, amber, &c. Ship-building is extensively carried on. Memel was founded in 1252, and fortified by the knights of the Teutonic order. It has repeatedly suffered from destructive fires. The population in 1881 was 19,660.

**MEM'LING or MEMMELINC, HANS**, the greatest Flemish painter of his age, in whom the school of the Van Eycks reached its culmination, was born probably about 1430, at or near Constance. His two greatest works are—"St. Ursula and her Companions," and the splendid altar-piece of the "Marriage of St. Catherine," at Bruges. The National Gallery has a fine Madonna and Child enthroned, from his hand. He far excelled his predecessors in delicacy of execution and softness of outline. There are pictures ascribed to Memling at the Hague, at Antwerp, at Louvain, at Berlin, and at Munich. The date of his death is uncertain, but it probably took place in Spain about 1495.

**MEM'LUKS or MAMELUKES**, the famous slave-rulers of Egypt, are divisible into three distinct periods—the Bahri, 1250 to 1382; the Burgi, onwards to 1517; and the Ghuzzi, from thence to 1811. We meet first with the *Bahri Memluks*, the earlier division, at the time of the captivity of St. Louis (Louis IX. of France) at Damietta, where these ferocious Turkish slaves loaded their heroic prisoner with chains and treated him with other indignities, their master, the Eiyoub sultan of Egypt, Es Salih having died and government being for the moment somewhat lax. Es Salih had thought to restore the vigour of his army and protect himself and his dynasty by enrolling a bodyguard of Turkish prisoners and slaves, usually styled "Memluks." The new guards were found so troublesome in times of peace that they received quarters on an island (*Bahri*) in mid-Nile, whence their name "Bahri." These savage Turks, perpetually recruited by fierce lads kidnapped or purchased by the Syrian slave merchants from the Turkish hordes, soon dominated the army, and, as in St. Louis' case, in times of stress they were virtually masters of the land.

Turan Shah, the late sultan's son, hurried from Mesopotamia to restore order, and at once set free St. Louis at the price of Damietta and 40,000 pieces of gold, and required explanations of the unworthy personal treatment of the king from his stepmother, who had seized the regency. This woman, herself a Turkish slave, broke out into open rebellion, drove Turan into a tower by the Nile and set fire to it, the wretched monarch imploring mercy from the battlements in vain, and offering abdication as the price of his life. Mad with delight at this atrocious scene the Bahri Memluks rushed upon the French king, who had not yet left the town. His venerable aspect stayed their brandished scimitars, and suddenly passing to the other extreme they begged him to become a Moslem and their sultan. On his refusal they escorted him homewards respectfully, and elected as sultan the queen herself (1250). She married their Emir, but afterwards becoming jealous of him had him assassinated, whereupon his first wife called her female slaves around her, fell upon the sultana and beat her to death with wooden sandals, afterwards throwing her naked body into the moat of the fortress.

This was the beginning of the Bahri Memluks, the slave sultans of Egypt, and it seemed well to give it in detail, as it serves fairly for a type of their horrible and capricious rule. When a sultan died, the fiercest contest of course ensued for the succession, and the great boys prepared themselves for this by the constant increase of their military slaves. Incessant discipline and reckless courage were essential to their system, for no one knew what the next moment might bring forth. The sway of these Turkish slave monarchs extended over Egypt, Nubia, Arabia, and Syria; the chosen (slave) forces of the boys numbered 25,000 horse, and they engaged a paid army of 107,000 foot, adding 50,000 or 60,000 Arabs as occasion needed.

When the second division of Memluks came in, the *Burgi Memluks*, who were Christian renegades and slaves, this system still prevailed unaltered, except that the Burgi purchased child-slaves as well as women in Georgia and Circassia, being too proud to marry the native Egyptians, and their European slave-wives proving unable to rear strong children in the enervating climate of Egypt. Thus it is literally the case that of the two oligarchies, Turkish and Christian renegades, ruling Egypt and its subject territories from 1250 onward for two and a half centuries, (or for over five centuries if we count also the period of their semi-independence, down to the time of Mehmet Ali), there was not an individual sultan or ruler who either was not an actual slave at the time of his rise to power or had not originally been one.

The first oligarchy, the Bahri Memluks, never equalled in military glory their predecessors the Eiyoubite sultans (the most famous of whom was Saladin), but curiously enough it is under them that we find the finest development of Saracenic art, and this too notwithstanding the pressure of continued invasions of the Moguls. The famous Memluk sultan Beybars (1260-78), greatest of the Bahris, rose to power by assassinating his predecessor. He received at his court the descendant of the Abbaside caliphs, El Mustansir Billah, the spiritual head of Islam, and he and a long line of shadowy caliphs after him reigned or assumed to reign at Cairo under the wing of the slave sultans of Egypt. Under Beybars began that lovely Moorish architecture which renders the mosques of Cairo, its palaces, and gates so celebrated. A precise account of the career of the Bahri Memluks is not necessary, but one or two things call for notice. The first is the fall of Acre in 1291, the last remnant of the conquests of the Crusades, in which town from the "King of Jerusalem" down to the commander of some of the lesser orders of knights, no less than seventeen sovereign authorities (or "nations") assumed to hold sway. It is almost incredible, with such a divided city, that it held out for the thirty-three days the siege lasted. The king,

the patriarch, and the grand-master of the Hospitaliers escaped; but to the 60,000 who remained the dire alternative of death or slavery was proffered. The second is the expulsion of the Mogul Tartars from Syria by En Nasir in 1302, when a ghastly procession at Cairo took place after the victory, each one of the countless Tartar prisoners carrying the gory head of one of his fellow-soldiers by the hair, with an odd thousand or so of these dreadful trophies borne on lances besides. En Nasir was very brutal to the Christians, and to the Jews also, making them wear blue and yellow turbans respectively, forbidding them public work, or the possession of horse or mule, and encouraging their persecution.

The Burgi Memluks (1382-1517) were, as has been said, Christian slaves, bought as boys when the Turkish supply failed, and compelled to embrace Mohammedanism. Eventually they became so powerful that in 1382 their chief emir, Barkuk, seized the power from the Bahri boys. Barkuk was a capable warrior, and left his people more flourishing than they had been for long before, notwithstanding his dangers from the redoubtable Mogul Timourlang (Tamerlane), for he was wise enough to make peace with that scourge of humanity. His successors, less wise, suffered for their rashness.

The end of the Burgi Memluks as independent sovereigns was at the hand of the Ottoman sultan Selim, who on some trumpety pretext invaded Egypt and annexed it to the Ottoman dominions (1517). In the bloody fight at Aleppo the routed Memluks literally rode over their unhappy sultan in their flight, and a desperate house-to-house conflict in Cairo sealed the fate of the country. Selim, the inflexible, was wise enough not to stickle for the exact truth of his surname after two such terrible victories. He crucified at the gates of Cairo the young Burgi who had organized the resistance, but did not seek to annihilate the Burgi dominion. He appointed a pasha with a council of Turks, and divided the country into twenty-four parts, each part being ruled over by one of the chief Memluk boys. The chief boy was called Sheik-el-Beled (ruler of the metropolis), and, as Selim had foreseen, the strife to attain this post kept the boys weak with mutual jealousies. Selim had got into his power the last of the Abbaside caliphs, so long supported in a sort of Mohammedan papacy by the Memluks. He procured, by what arts we know not, his own nomination as caliph in succession to the then holder, and no sooner was this obtained than the unhappy prince disappeared. The Ottoman Turk has since this time assumed the caliphate, and is generally recognized as spiritual head of Islam, except by the great Shiah nation of Persia.

The *Ghuzz* (1517-1811). The ghastly comedy of blood-stained intrigue which Selim had started continued for two centuries to ruin Egypt and keep the Ottoman rule from extinction. During this time the purchase of slaves by the Memluks went on as before, but so many came from the Circassian tribe of the *Ghuzz* that these later semi-independent Memluks are called by that name. The most faithful and intelligent slave usually succeeded to his master's position, and provided for his successor in the same strange way. One of the Ghuzz, Ali Bey, Sheik-el-Beled at that time, actually achieved independence in 1768, but perished by treachery in 1772. His assassin was his successor, and he was rewarded for his treason by being made pasha. At this man's death a violent contest arose between Murad, Ibrahim, and Ismail Beys for supremacy, and this was still continuing when the descent of Napoleon Bonaparte upon Egypt with a French army, in 1798, caused them to sink their differences for a time and join to try and repel the invader. Their inability, brave and well-equipped as they were, to cope with the genius of the greatest soldier of the age, was shown in the decisive battle of the Pyramids (21st July, 1798), when they

were commanded by Murad, and in spite of the most magnificent display of horsemanship and dauntless courage, were completely defeated and scattered by the French infantry. The actual Memluka at this time numbered about 12,000 men, an average of 500 to each bey, but with their servants and auxiliaries the number was trebled or more.

The English counter expedition, under Sir Ralph Abercromby and (after his death) General Hutchinson, made allies of these Memluka; and though Murad Bey died as he was descending from his fastnesses in Upper Egypt to meet the British, Ibrahim actually met and joined with General Hutchinson, and so also did Murad's successor, Tambourgi, sinking his contest with Ibrahim for the time.

In return for their loyal support General Hutchinson re-organized the Memluk government and re-established it while waiting for the capitulation of Cairo, in spite of the jealous opposition of the Capitan Pasha (Lord High Admiral) and the large Ottoman army with him. So bitter was this jealousy that the pasha induced most of the leading beys to join him at dinner with the English admiral before Alexandria on board the admiral's flagship, and when they had taken boat for this purpose, all their suspicions being at rest because of their destination, the pasha caused a riot to arise, and in the confusion nearly every man was shot down. The wrath of the English army and navy was extreme. The pasha declared he had only meant to kidnap the beys and carry them to Constantinople, and was quite astonished that this excuse was held to be an additional outrage upon our flag. General Hutchinson (by this time raised to the peerage) rather surlily patched up the quarrel and left Egypt with the bulk of his army at the same time as the French army which had capitulated to him (September, 1801). Peace being signed with France and all matters finally arranged, the last of the British forces quitted Egypt in March, 1803.

With the Albanians of the Capitan Pasha's Ottoman army was a soldier of fortune, by name МЕМКЕТ АЛИ, an Arnaout, or Albanian-Greek Mussulman. This man's extraordinary rise to supreme power in Egypt is described in the article under his name. His massacre of as many Memluk beys as he could secure in 1805 was not sufficient, he found, to quell the courage of these fierce proud chiefs, and he resolved upon the dreadful massacre which has for ever stained his name with infamy.

On the 1st of March, 1811, having lived for some years at peace with the Memluk beys, to whom he had given various parts of the country to govern, Mehemet Ali invited all the chief beys and their retinues—470 men in all—to Cairo to witness the investiture of his son Tussoun with the command of an expedition against the Wahabis. The pasha received them courteously, and after coffee they formed in procession and proceeded with the pasha's guard of honour down the steep and narrow road leading to the great gate of the citadel. The guards in front passed out into the city, but as soon as the first of the Memluka arrived the gate was shut in his face. The guards behind threw up a barricade already prepared, and began to fire on the unhappy beys, while those in front, having hastened back by paths known to themselves, appeared on the heights above and poured down volley upon volley amidst the writhing crowd within the gates below them. Pinned in this wretched hole, without even a possibility of a stroke in revenge, all that gilded glittering host became in a few minutes a mass of dying desperate men, struck down by the hoofs of their own maddened, wounded horses almost as much as by the bullets of the pasha's assassins. The frenzied curses of the dying princes rose amidst the rattle of the musketry. Mehemet Ali listened from the innermost recesses of his harem, deathly pale, motionless and silent, except when from time to time he called for water to moisten his parched lips. One chief alone succeeded in

leaping the gate and escaping; he fled safely into Syria. This massacre was the signal for like scenes throughout Egypt, and 1200 Memluka fell in a few days in the provinces. The few who escaped joined the aged Ibrahim Bey, now seventy-five, and they kept up a resistance for a time. Mehemet Ali's eldest son drove them to the Soudan, where they founded the town of New Dongola as their stronghold, and trained a black army. Ibrahim Bey died there in 1816; and Ismail, third son of the pasha, shortly after dispersed them for ever. From that time to the revolt of Arabi Egypt was internally at peace.

**MEMMI, SIMONE** (*Simone di Martino*), was a very celebrated Italian painter of the fourteenth century. He was born at Siena in 1284, and was a rival of the Florentine Giotto. Simone now owes his fame chiefly to Petrarca; they were both living at the same time at Avignon during the residence of the popes there, and Simone painted the portrait of the celebrated Madonna Laura for the poet, who rewarded him by writing two sonnets in his honour. Few of Memmi's works now remain; the principal are the frescos of the Capella degli Spagnuoli at Florence in Santa Maria Novella, and a fine set of frescos in the lower church at Assisi. He is called Memmi, because his brother-in-law, Lippo Memmi, was also an artist, and the brothers-in-law were taken for brothers.

**MEMMIUS, CAIUS**, the name of two distinguished men in ancient Rome: I. Tribune of the plebs during the war with Jugurtha, who insisted upon the king being brought personally before the Senate, his object being to expose the rottenness of the aristocratic party, who were bribed to a man by the gold of Jugurtha. At the first question he put to the king the consul interfered and forbade any answer (B.C. 111). Memmius, though a reformer, was no democrat, however, and when the great general Marius headed the attack of the popular party on the Senate in B.C. 100, putting forth Saturninus and Glauca as the ostensible leaders of the movement, Memmius stood against them for the consulship. The two desperadoes fell upon him in the Roman streets and beat him to death.

II. Son-in-law of Sulla the dictator, and one of the senatorian opponents of the illustrious Cæsar, who filled most of the great offices, but was accused of bribery when he stood for the consulship in 54 B.C., and was exiled to Mytilênê. He was a munificent patron of literature and art, and has the distinguished honour of the dedication of Lucretius' great poem. His wife Fausta was divorced by him, and then married the notorious Milo. His son, also Caius, was tribune of the plebs in 54, and prosecuted Gabinius for misgovernment in Syria. In 34 he became consul.

Another Memmius, Publius Memmius Regulus, consul in A.D. 81, is noteworthy as the husband of Lollia Paulina. The Emperor Caligula (Caius Cæsar) hearing of her beauty compelled him to divorce her that he might himself marry her. He tired of her and divorced her. When his successor, Claudius, had put to death Messalina his wife, Lollia, who was ambitious, sought to entangle his affections; upon which her rival Agrippina caused her to be put to death.

**MEMNON**, in Greek mythology, a son of Eös or the Morning, and Tithónos or the Sun, half-brother of Priam, took part in the Trojan War, as prince of Ethiopia, and was slain by Achilles. His allegorical character, however, is shown by the tears of morning dew which his mother shed over his corpse, just as the big drops fell from the sky when Zeus bewailed the fate of his son Sarpedón. Memnón, at the request of Eös, was raised from Hades to Olympus.

The name Memnon would seem to be corrupted from Mei-amun, beloved of Ammon. The Greeks applied it to a celebrated statue in the Ramesseum in Upper Egypt, which at sunrise either really emitted, or was fabled to emit, a musical sound like the voice of a harp. See EGYPTIAN ARCHITECTURE.

**MEMORANDUM OF ASSOCIATION**, the first document necessary to the formation of a limited liability company. It must be signed by seven shareholders in the presence of a witness or witnesses, and must state, (1) the name of the company; (2) whether its registered office is situated in England; (3) the objects of the company; (4) that the liability of the shareholders is limited; and (5) the amount of the capital. This being presented the company is registered and at once comes into existence. The government "articles of association" (the rules governing the company) have also to be adopted or fresh ones to be drawn up, which are subject to the control of the government. The company is bound by its memorandum of association, and cannot afterwards alter it.

**MEMORY** is reproductive imagination, that faculty of the mind by which past states of thought or sensation can be revived in their regular order, frequently indeed to the extent of complete trains of ideas and perceptions. Thus memory may be either passive or active; we may either permit the brain to present us with images of the past, or we may concentrate our attention upon a given point of our life and so conjure up the image at our will.

Memory rests upon the **ASSOCIATION OF IDEAS** [see that article], the principle by which ideas which resemble one another or contrast with one another, or which form part of an orderly coincidence, or sequence, tend to cohere, so that thinking of one of them calls up the others. As we walk along a road the objects we see suggest thousands of such trains of thought, any of which, by excluding all disturbing associations, we can pursue at will. This is reproductive imagination, and it is easy to see how, with a little progress, it can turn to constructive imagination. For no man can create, not even a Shakespeare: all that can be done by the greatest master of imagination is to shift, as in a kaleidoscope, the many images of a retentive memory until they fall into some new and striking combination.

The greater the keenness of discriminative sensibility the finer the memory. Thus we remember sights best of all, for the eye is the most keenly discriminative sense; then sounds; then, at a distance, touches, tastes, and smells. Thus, too, the keenest-witted persons have ordinarily the best memories.

The growth of memory means an increase of retentive capacity, whether (1) by easier acquisition of fresh impressions, (2) by longer retention of impressions, or (3) by easier reproduction of past impressions; and the memory may develop in one of these ways without doing so in the others. But the main defects of memory are want of tenacity and slowness in reproduction; and it is evident therefore that the only true way to improve the memory and cure these defects is by exercise. We cannot acquire (speaking broadly) beyond certain limits, especially as we grow older, but we can practise retention, aiding ourselves by repetition of the impressions desired to be retained, and we can in the same manner acquire swiftness of memory by exercise. Committing to memory is work that should be confined to the times of greatest vigour and freshness, and every means should be taken to awaken the liveliest attention to the matter desired to be remembered. This is the secret of the value of an intelligent writing-out of a passage to be learned, helped as it is by the muscular memory of the hand as it travels over the paper, and by the visual memory of the lines as they are steadily looked at to be copied.

The art of training the memory, or *mnemonics*, has taken many practical turns. Rhyme, alliteration, metre, are perpetually pressed into its service. A string of dates, or names, or rules, can be readily remembered in some doggerel form which sheer learning by rote would not retain for long. Pictures also and diagrams serve to impress the accompanying text well upon the memory. By using

letters for figures on some agreed plan, dates or formulae may be expressed in words and thus remembered. For instance, in a plan which gave *v* to the figure 1, *i* to 8, *c* to 3, *t* to 7, the syllable *vict* would correspond to the year of Victoria's accession (1837), and so on. But in many of these devices it is as difficult to remember the key-plan as it is to remember the separate facts desired. The main thing is to fix the matter upon some "peg" or firmly developed association of the mind, and arrange it in some clearly defined order; so that, first, it can be easily brought to mind when required; and secondly, when once started the train of thought may flow readily to its conclusion.

**MEMPHIS** (the *Mem Nefer* or "Good Station" of the Egyptians, and the *Memf* of the Arabs), an ancient city of Egypt, once the rival of Thebes in magnitude and splendour, was situated on the western bank of the Nile, about 10 miles south of Cairo, on the site of the present villages of Kafr-el-Tyat, Metrahenny, and Koum-el-Azyzeh. There are still considerable remains scattered over an extensive area, though it has for hundreds of years been used as a stone quarry by the successive conquerors of the country.

**MEMPHIS**, a city of the United States, in the state of Tennessee, just below the entrance of the Wolf River into the Mississippi, on the right bank. It stands on a bluff, 60 feet above the highest level of the river, and strata of sandstone projecting from the base form a convenient and firm landing-place. It is the best situated and most important town on the Mississippi between St. Louis and New Orleans, and has a very extensive trade. The river frontage is formed by an esplanade, 3 miles in extent, and 300 feet wide, and the town has a fine appearance from the river. It is accessible at all times of the year. The town is well laid out and drained, and contains numerous churches, a public library, a fine custom house, and a cotton exchange. The industries comprise cotton packing, oil refining, iron founding, and the manufacture of tobacco. The population in 1880 was 33,592.

**MENAC'CANITE** is a titaniferous iron containing a small proportion of magnesia; it is of an iron black colour and has a submetallic lustre. It crystallizes in the hexagonal system, but is generally found in small crystals or grains in granitic or metamorphic rocks. In parts of Canada it forms beds upwards of 90 feet thick.

**MENAI STRAIT.** This narrow channel, about 11 miles in length, which separates the island of Anglesey from the mainland of Wales, intervenes on the great mail route from England, by way of Holyhead, to the eastern coast of Ireland. It is crossed by a suspension bridge, of which the first stone was laid 10th August, 1819, and the mail-coaches drove over it for the first time 30th January, 1826. The Menai Bridge was planned and executed by Telford. The distance between the supporting pyramids or points of suspension is 560 feet, and the height of the carriage-way above high water in the strait is 100 feet. The roadway is divided into two carriage-ways, each 12 feet wide, with a footpath 4 feet wide between them. The strait is also spanned by a still more remarkable structure—the Britannia Bridge, built by Robert Stephenson, consisting of two tubes of iron placed side by side, through which the up and down trains of the Chester and Holyhead Railway respectively pass. The entire length of each tube is 1513 feet, and the height above high water 102 feet. Each tube consists of four pieces, the ends of which rest on a central pier built on the Britannia Rock in the middle of the Menai Strait, two towers on the shores of Anglesey and Carnarvonshire respectively, and two abutments further inland on each coast. There are therefore eight tubes in all. The clear length of each tube, reaching from the side towers to the central tower, is 400 feet; the entire length of tube

across the strait is 920 feet, leaving 593 feet for the length of the side tubes. The top of each tube forms a regular arch; the bottom is quite straight and horizontal. The interior height is 26 feet in the centre, and 18 feet 9 inches at the ends. The internal width is 14 feet from side to side. The tubes are formed of plates of wrought iron three-eighths to three-fourths of an inch thick, strongly riveted together. The weight of the whole structure is 10,540 tons, and its cost amounted to £601,865.

**MENANDER** (Gr. *Menandros*), a Greek poet, the chief writer of the New Comedy, was born B.C. 341, and died, as some suppose, by drowning, B.C. 291. He wrote more than 100 comedies, of which only fragments remain. His plays were probably very simple in the dramatic action. Terence, who professed to imitate him, did not adhere to this simplicity, but added to the main plot a subordinate one taken from a different piece of Menander; thus, as he says, making one piece out of two. There is a superb marble antique of Menander (seated) in the Vatican at Rome. The fact of his receiving the honour of a statue shows the esteem in which he was held.

**MENDELSSOHN-BARTHOLDY, FELIX**, the illustrious musical composer, was born at Hamburg, 3rd February, 1809. His full name was Jakob Ludwig Felix Mendelssohn-Bartholdy. His grandfather was the famous Jewish philosopher Moses Mendelssohn, whose name was literally accurate, for he was the son of a poor schoolmaster, Mendel. Moses, Mendel's son, became crystallized into Moses Mendelson (or, in Ger., Mendelssohn). Moses was small and humpbacked, peculiarities which reappeared in his grand-daughter, Felix's favourite sister, Fanny (Madame Hensel). The second son of Moses, Abraham Mendelssohn, married Lea Salomon-Bartholdy, and settled in Hamburg. He adopted his wife's family name of Bartholdy in addition to his own. Here he had three children—Fanny, the eldest (1805), Felix (1809), Rebecca (1811); Paul was born later (1813). Hamburg was at this time under the tyranny of the Napoleonic occupation, and the Mendelssohns fled in disguise to Berlin in 1812. Abraham's sisters turned Catholic, and one of them married that great man of letters, Frederick von Schlegel. Abraham and his brothers remained Jews; but the former, seeing the growing narrowness of his co-religionists (Judaism was not then as it has happily now become), and feeling sure that the future would increase the evil, resolved, like the elder Disraeli in England about the same time, to sacrifice his ancient faith, and the children were baptized as Protestants. The son of wealthy parents, Felix received a careful education, and his natural disposition for music was nurtured by his mother, who provided him with the best examples for study, and judiciously rewarded his youthful exertions. At Berlin their home was the resort of the most eminent artists and men of letters. Here the young musician was placed under the tuition of Berger for the pianoforte, and Zelter for composition. His progress was extraordinary, and he made his first appearance in public in 1818, when he played in a trio for pianoforte and horns. In his twelfth year appeared his first published pianoforte quartet, dedicated to Goethe, whom he had visited at Weimar, and from whose counsel and encouragement he derived peculiar benefit. He was now writing incessantly for voices, pianoforte, orchestra, and quartet, and had the inestimable opportunity afforded him of conducting his compositions, with a choice band, at the Sunday morning performances which made the Mendelssohns' house a centre of attraction in Berlin. He wrote four small operas before "Camacho," which latter he finished in 1825, just after the well-known fine "Capriccio" for pianoforte in F $\sharp$  minor. (It was produced, after endless cabals and intrigues on the part of Spontini the conductor, at the Berlin Opera in 1827; it fell rather flat, and Mendelssohn never sought to get it performed again.) In the spring

of 1825 he visited Paris, and was introduced to Cherubini, who, recognizing both his present powers and future promise, warmly advised him to continue his musical studies. In 1825 and 1826 he produced his overture to the "Midsummer Night's Dream," and his Otteto, in E flat, two of the most wonderful works ever produced at so early an age. Not only are the melodies exquisite, but the highest art is perceptible in their arrangement and development.

At this time the genius of Felix was recognized on all sides, and Abraham would say comically, "When I was a boy I was always spoken of as the son of the famous Mendelssohn, and now that I am a man it appears I am the father of the famous Mendelssohn." The year 1828 saw Mendelssohn engaged upon his splendid concert overture illustrating Goethe's poem "Die Meere-Stille und Glückliche Fahrt" ("A Calm Sea and a Prosperous Voyage"), upon cantatas, upon the first essays in what afterwards became a favourite form for pianoforte pieces with him, the "Lieder ohne Worte" (or "Songs without Words"), and other works, as well as rehearsing the great "Passion" of Bach, which he produced in 1829 for the first time since Bach's death. In fact, great as Mendelssohn was in himself, the spur he thus gave to the renewed study of a still greater musician must remain one of his own chief honours, and entitle him as much as anything to our lasting gratitude. As he said laughingly to his friend and cordial helper, Edward Devrient, "It is curious that to you, an actor, and to me, a Jew, has fallen the task of restoring the greatest Christian work to the people." The enthusiasm at the time was unbounded, and the success was entirely due to Mendelssohn, who managed the rehearsals with unequalled tact. After having hesitated so long, his father now consented to his son's adopting music as a profession.

The incidents of a musician's life are neither many nor striking, and those of Mendelssohn's may easily be recapitulated. He visited London in 1829, and at once secured a reputation. His Symphony in C minor was performed at the concerts of the Philharmonic Society, while his pianoforte playing delighted the most critical and fastidious audiences. While in London he wrote his operetta of "Heimkehr aus der Fremde," known in English as the "Son and Stranger"—as a love-offering on the occasion of the "silver wedding" (the twenty-fifth anniversary) of his parents. An instance of his genius may here be given. After a performance of the overture to the "Midsummer Night's Dream" (a prime favourite with English audiences), it was found that Attwood, the conductor, had lost the score in a coach. "Never mind," said Mendelssohn to his poor friend, half mad with despair, "I'll turn to at once and write another." When it was next tried with the orchestral parts not an error was found. In July he left London with friends for a tour in Scotland, and he tells us himself that the germs of the "Scotch Symphony" and the "Hebrides Overture" occurred to his mind amid all the fascinations of a first view of the fine scenery of the Western Isles. He returned in September, and after a short confinement to the house, occasioned by an accident to his knee, he left for home again, and was in Berlin in November.

In 1830 he visited Italy, and revelled in the glorious ruins of ancient Rome. The "Walgurgis Night Cantata" belongs really to this time, though not published for many years later, and so do the Italian and Scotch symphonies. After trips to Naples and Venice, he travelled through Switzerland, everywhere deriving inspiration for his versatile genius, which was keenly alive to the external influences of nature. We find him again in England in April, 1832, and 1833, producing on the former occasion his Pianoforte Concerto in G minor, and Overture to the Hebrides; on the latter, the "Trumpet Overture," and Symphony in A minor. The first book of "Songs without Words" was published by Novello in 1832, and the original score, in



Mendelssohn's exquisitely neat handwriting, was exhibited at the London International Exhibition of 1885, where so universally known a piece attracted crowds of amateurs.

In 1833 Felix conducted a festival at Düsseldorf with such success that the town authorities engaged him to continue their musical chief for three years, at a yearly salary of £90. Here he produced Handel's greatest oratorios Mozart's operas, Beethoven's masses, and works of that calibre. In 1835 he became conductor of the famous Gewandhaus Concerts at Leipzig, and also conducted the Rhienish Festival at Cologne in June of that year. The death of his father, in November, 1835, was a severe shock to his affectionate nature, and the solemn impression which it produced may be traced in his magnificent oratorio of "St. Paul." Home joys were exceedingly dear to him, and his happiness was accordingly increased and confirmed by his marriage in the spring of 1837 to Mdlle. Cécile Jeanneraud, of a good Frankfurt French family.

In 1837 Mendelssohn was for a fifth time in his favourite England, conducting his oratorio of "St. Paul" at Birmingham, and producing his D minor Concerto amid applause enough to have turned any one's head. The next few years were chiefly devoted to Leipzig and the Gewandhaus Concerts, and many of his loveliest smaller works (Serenade and Allegro Gioioso, Violin Concerto, &c.) are due to this time. He also produced for the first time a symphony of Schubert's in a proper manner. That Schubert could write anything higher than an exquisite song came upon musicians as a revelation akin to the Bach discovery years before. In 1840 he was once more in England, overworked and popular as before, and he brought with him the well-known "Lobgesang" (Hymn of Praise), a large work on the general plan of Beethoven's "Choral Symphony," but with sacred words. This was complete, as we now know it, with the exception of the exquisite scena, "Watchman, will the night soon pass?" and the duet, "I waited for the Lord," which were after-thoughts. It at once gained the hearts of English music-lovers, and has remained one of the most favourite works in the whole range of music up to the present time. Not a year passes without performances of it in various parts of the country. This year saw the beginning of the well-meant but most distressing government patronage of Mendelssohn. Nothing would serve the King of Prussia but the creation of a new academy at Berlin, with Mendelssohn at its head. The worry of official bother, the loss of time, of health, and it may be of life itself, which we must attribute to this foolish persistency, galls us when we reflect upon it. Mendelssohn did all he could to throw off the work, but the combined pressure of the king and of his mother fatally constrained him. The only good coming out of this royal patronage was the production of the exquisite set of choruses to the Greek tragedy of "Antigone," by Sophokles, in 1841. During this winter Mendelssohn finally completed the "Scotch Symphony," which had been so long in hand; the "Italian Symphony," still earlier conceived and written, was unpublished even at his death, so fastidious was he in the polish of great works. (Witness also his large alterations of the "Lobgesang," and of "Elijah," when "Cast thy burden" and "Lift thine eyes" were added, the scene with the widow entirely re-written, and "Hear ye, Israel," also.) The "Scotch Symphony" was the great novelty that he brought with him to London on his seventh visit, in 1842, and he had the pleasure of dedicating it to the Queen, who, with Prince Albert, was among his most ardent admirers. The permission was given at some interviews held at Buckingham Palace by the Queen's command, and charmingly described in Mendelssohn's letters.

The wretched Berlin business was brought into better train at the close of 1842, by Mendelssohn demanding to have his salary reduced by half, but to have the freedom of living where he liked. The king, who honestly meant only

to please and reward him, at once granted his request, and at the same time founded the famous Dom-Chor (cathedral choir), which he requested Mendelssohn to regard as under his direction, and hoped (as indeed came about) that he would write for it from time to time. But all the worry, following closely upon the death of his mother, was sadly depressing to the highly-strung nature of Mendelssohn: his gaiety left him for long stretches at a time; the end had, in fact, begun. But at no time did he write finer, if indeed such fine music; and it was to 1843 that we owe the grand creation of the Conservatorium of Leipzig, very largely due to Mendelssohn, and showing what he could have done at Berlin if he had not been strangled in the red-tape of Prussian bureaucracy. Mendelssohn was at the head; Moscheles, Hauptman, Schumann, &c., were professors; Joachim was one of the first pupils; Sir Arthur Sullivan was a later pupil, though not till 1858, long after Mendelssohn's death; and the institution keeps up its enormous reputation to our own day.

The music to the "Midsummer Night's Dream," a wonderful piece of "matching" to the overture written many years before; the exquisite psalms, "Hear my Prayer" and "Judge me, O God;" the music to the "Œdipus at Kolonos" of Sophokles, and to the "Athalia" of Racine; plans for operas on Shakespeare's "Tempest," and on the Lorelei Legend; more yet of the matchless "Songs without Words," for pianoforte, a species of musical composition which he may be said to have created; and above all, the grand oratorio of "Elijah," first produced in Birmingham in 1846, were among his later and sublimer works. In 1843, 1844, 1846, and again in 1847, he visited England. In the latter year it was evident that his health had given way under the pressure of incessant work and continual excitement, and the tidings of the sudden death of his favourite sister Fanny produced a terrible effect on his shattered frame. He died at Leipzig, on the 4th of November, 1847.

It would be difficult to decide in which branch of his art this great composer displayed the most astonishing genius. He was the best contrapuntist since Mozart. Almost unrivalled as a melodist, his command over all the resources of harmony was supreme. In sacred and secular music he was alike distinguished by the fertility and originality of his ideas, which were never forced, but always charmed by their spontaneity. Nor was he only a musician: as a draughtsman he might have attained renown. He was well versed in the ancient classics, and spoke and wrote both English, Italian, and French. In society he was perfectly fascinating. No one ever forgot him who once met him. Up till his latter years he kept his boyish spirits fresh, and was full of fun and absurd pranks with his friends. With all this, he had almost punctilious business habits. Every letter of importance he received was pasted into a thick large volume in its order: twenty-seven such volumes exist. Everything was always arranged with the most fastidious neatness, and each letter of his is almost a specimen of fine calligraphy. His music-writing is simply marvellous in beauty. It is incredible how he found time for it all. Perhaps he overcrowded his life, to our great loss and sorrow.

Mendelssohn was slightly under 5 feet 6 inches in height, thin, very quick in movement, and, as has been said, expressing as much by his body as his face. He had fine large brown eyes, extraordinarily bright, a fresh high colour, and a mass of wavy, thick black hair, which tossed over his face as he talked with many vehement noddings and shakings, small hands, and very taper fingers. His laugh in younger days was infectious, altogether irresistible; over a caricature in a friend's album or a practical joke, such as playing extempore duets with clenched fists (as Moscheles tells), or such harmless fun, he would double up with laughing until he could do nothing further but shake his hands



quickly to and fro at the wrist to express his delight. Until the sorrows of his later years he was very merry.

It is not hard to trace this eager joyous temperament in his music. It at once gives it a great charm and a limit. It prevents it from stirring the deepest depths of the heart. Beethoven, Schumann, and Schubert, out of the abyss of their profound despair, write as it were with 'their hearts' blood. Often their music is more than one can bear in moments of great stress. These sublimest flights are not for Mendelssohn; but in his own way he too is as great as any of them.

Of books about Mendelssohn there is a large quantity. Two charming volumes of his letters have been published and translated into English (London, 1862), and numbers of his letters are scattered among other works. We have "Lives" by his friend the late Sir Julius Benedict (1850); by Lampadius (1848; English translation, 1878); by his friend the actor, Devrient (1860), excellently translated by Mrs. Macfarren (London, 1869); and by his devoted pupil W. S. Rockstro (London, 1884). There are "Recollections" without number, of which the best are—"Goethe and Mendelssohn," an account compiled from original documents, &c., of the three Goethe visits, by Mendelssohn's eldest son, Carl, and translated very carefully by Miss Von Glehn (1872); by Ferdinand Hiller (same translator, 1874); by Elise Polko (1869); by Mendelssohn's nephew, S. Hensel (1879); by Schubring (1866); by Horsley, the famous glee-writer, a pupil of Mendelssohn's (1873), &c., as well as notices of separate visits or meetings in very many of the musical publications from the time of his death till now. But a full and accurate life yet remains to be written out of the ample materials which abound. The long notice in Grove's "Dictionary of Music" (1884), covering nearly sixty pages of close print, is perhaps the most accurate and comprehensive account as yet, and gives the only available catalogue of Mendelssohn's works; that in his "Letters" is not correct, and is very defective.

**MENDELSSOHN, MOSES**, an eminent Jewish philosopher, was born at Dessau, 10th September, 1729, of poor parents, his father being a Jewish schoolmaster named Mendel. In spite of poverty and an enfeebled constitution, he contrived to obtain a good Jewish education, to which he added Latin, mathematics, and philosophy. After some years spent in indigent circumstances at Berlin, he became private tutor to the family of a prosperous Jewish silk manufacturer of the name of Barnard, who afterwards made him clerk and partner. In 1754 he was introduced to Lessing, with whom he contracted an intimate and lifelong friendship. Conjointly they published an essay on "Pope as a Metaphysician" in 1755, which was followed by other literary productions on the part of Mendelssohn. These publications brought him into close and familiar contact with Abt, Sulzer, and Nicolai, to whose literary periodicals he became an active and prominent contributor. In 1764 he published his first important metaphysical work, entitled "Letters on the Sensations," and about the same time his prize essay on the "Evidence of Metaphysical Science" induced the Berlin Academy to elect him a member of their body, but Frederick, called the Great, from prejudice against the Jews, struck his name off the list. In 1767 he published his "Phædo," a dialogue in the manner of Plato, in which he endeavoured to prove the immortality of the soul; in 1783 "Jerusalem," a plea for toleration and a defence of his faith; and in 1785 his "Morgenstunden" or "Morning Conversations," in which he endeavoured to refute the system of Spinoza. This work was interrupted by his death at Berlin, 4th January, 1786. An original thinker and elegant writer, he contributed much towards the removal of the prejudices which he found existing against his race. He firmly resisted all the attempts that were made to induce him to become a Christian, and he was untiring in his efforts to improve the moral and

intellectual condition of his co-religionists. Although the breadth of his views gave offence to the more bigoted among them, he exercised an immense influence in raising them from the condition of mental apathy into which they had fallen, and in modifying their religious and theological views. His works were collected and edited by his grandson G. B. Mendelssohn (Leipzig, 1848-45, seven vols.)

**MEN'DICANT ORDERS** are certain religious associations in the Roman Catholic Church the members of which give to the church all the property they possess at the time of joining, and who afterwards subsist upon alms. They took their rise in the thirteenth century, when the older orders had become sadly corrupt, and when the influence of the church was palpably declining in Europe. The formation of any new order was forbidden by the third Lateran Council, but St. Dominic and St. Francis obtained permission to found the orders called after their name, and these were followed by the Augustinians. These soon became so popular and successful that to prevent the undue multiplication of similar orders the Council of Lyons, under Pope Gregory X. in 1274, limited the mendicant orders to four—viz. Dominicans, Carmelites, Franciscans, and Augustines. These orders have already been described under these headings. See also the articles under **DOMINIC, ST., and FRANCIS, ST.**

**MENDOZA**, a city of the Argentine Republic and capital of the state of the same name, is situated on a high plain, near the Andes, 700 miles N.W. of Buenos Ayres; much of the trade between the latter place and Chili passes through it. The old city was ruined by an earthquake on the 20th March, 1861, when 10,000 or 12,000 persons perished. The shock occurred about 8.30 p.m. It was remarkable for its destructive, but purely local effects, which did not extend beyond a radius of a few miles. Churches and houses were at once overthrown, and the place became an enormous graveyard. Three-fourths of the population, including Mr. Green, the British vice-consul, perished. For more than a year afterwards the survivors slept in fields and gardens, afraid to pass the night in a dwelling. The new city is a model of convenience, beauty, and sanitary arrangement, traversed by wide canals and by an elegant alameda. The population is about 10,000. The Portillo Pass connects Santiago with Mendoza during the summer, and has an elevation of 14,300 feet.

**MENELAOS** (Lat. *Menelaus*), in Greek heroic legend, was brother of Agamemnon and son of Atreus. He became king of Lacedæmon, and married the beautiful Helena. The Trojan prince Paris having carried off Helena to Troy, Menelaos called upon the princes of Greece, former suitors of Helena, to fulfil the oath they had all then sworn, to abide by her choice and protect her husband in his marriage. The result was the war of Troy. Menelaos was one of those concealed in the wooden horse which the stratagem of Odysseus contrived, so that the Greek chiefs might penetrate within the city, and all through the war he bore a distinguished part. Helena readily rejoined him, and they set sail for Greece after the fall of the city; but it was eight years before they reached Sparta. The legends depict them as living happily together afterwards.

**MENEVIAN GROUP** of rocks form the upper division of the Lower Cambrian; they are estimated to be about 600 feet thick, and rest conformably on the Harlech or Longmynd group; they are succeeded by the Lingula flags. Some authorities place these beds at the base of the Silurian formation; but in these older rocks many of the subdivisions are based on lithological variations and differences in the organic remains; in the absence, therefore, of unconformity the subdivisions may be grouped together according to their affinities. With the subjacent Harlech beds the Menevian group are closely allied, both in character and in fossil remains, about 23 per cent. of

the species being identical. The beds occur largely in the vicinity of St. Davids; hence their name, Menevia being the ancient name of that place; they surround the underlying rocks between Harlech and Barmouth. The fauna consists chiefly of trilobites. Of them the genera *Agnostus*, *Conocoryphe*, and *Paradoxides* may be mentioned; there are about four species of *Protospingia*. Among brachiopods are the genera *Discina*, *Lingulella*, *Obolella*, and *Orthis*. Among pteropods are *Cyrtolitea* and *Theca*. The first entomostracan, *Entomis*, and the first cystidean, *Proteocystites*, occur in this group, but neither gasteropods nor lamellibranchs have been found.

**MENGES, ANTON RAFAEL**, was born at Aussig in Bohemia, in 1728. He received a rigorous artistic education from his father, who was a painter. In 1741 his father went to Rome, taking young Menges with him. In 1744 Anton returned to Dresden, when Augustus appointed him court-painter, but he was permitted to revisit Rome. He soon began to distinguish himself by his original compositions, among the rest by a Holy Family, in which the Virgin was painted from a beautiful peasant girl, of whom he had become so enamoured that he turned Catholic for her sake and married her. His reputation was greatly increased by the numerous works he executed for Charles III. of Spain, who sent for him to Italy. His pencil was employed in decorating the royal palaces of Spain; and the "Apotheosis of Trajan," at Madrid, is generally considered his *chef-d'œuvre*. He died on the 29th of June, 1779.

**MEN'HADEN** (*Clupea menhaden*) is a North American fish of great economic value, belonging to the same family and genus as the herring. The menhaden, also called moss-bunker by fishermen, varies in length from 8 to 14 inches. The body is elongated and compressed, greenish-brown above and silvery below. The menhaden is abundant on the Atlantic coasts of North America, especially in Massachusetts Bay. These fish are largely used for bait, but are rarely eaten, as the flesh, though wholesome, is oily. For murre they are excellent. The menhaden is also valuable for the oil extracted from it. The menhaden fishery has of late years assumed extensive proportions in the United States.

**MENINGITIS** (Gr. *méninx*, a membrane) is the term used in medicine to signify inflammation of the membranes investing the brain. There are several varieties of inflammation of these membranes, depending chiefly on the cause. The most common is that known as *tubercular meningitis*, formerly called *acute hydrocephalus*, and now sometimes known as "brain fever," an acute and extremely fatal febrile disease which occurs with special frequency in young children between two and six years of age, though it is sometimes met with in infants, and also, but less frequently, in adults. In the case of children the symptoms begin with a feeling of listlessness and fretfulness, followed by disturbed sleep and pains in the head. After a day or two the pain becomes more severe, and it is attended by frequent vomiting and very often by convulsions. The tongue is white and moist, the abdomen drawn in so as to be concave instead of convex, and the thumb is turned inwards, while if the fontanel (the space between the bones on the crown of the head) be open, it will be found raised and perhaps pulsating unnaturally. There is also a peculiar vaso-motor irritability in the skin, so that if the finger-nail be lightly drawn across it a deep red wheal is left which remains for a long time. The closing stages of the disease are marked by drowsiness, which passes into stupor, and is followed by a state of complete insensibility and death. The early stages of this disease are very difficult to distinguish from those of the outbreak of a specific fever, or even from some of the troubles induced by teething, and when they become fully developed very little can be accomplished in the way of treatment. Beyond the application

of cold to the head, attention to the state of the bowels, and the administration of iced milk, beef tea, and perhaps a little stimulant, very little can be done, though the bromide of potassium is sometimes useful as a sedative and a means of mitigating the severity of the convulsions. The disease is not invariably fatal, but where it is not checked at the outset recovery is extremely rare.

*Traumatic meningitis* is the name given to that form of the inflammation which often supervenes upon a blow or injury to the head, which may also be accompanied by fracture of the skull. It does not generally make its appearance until a few days after the accident, and its onset is generally marked by a feeling of pain at the seat of the injury, fits of cold and shivering, followed by increased temperature, thirst, sickness, drowsiness, and semi-stupor. Treatment consists in the application of cold to the head, the keeping of the bowels open, and securing for the patient as much rest and quiet as possible. In the period immediately following the injury mercury may be given as a preventive, but it is of no use when the inflammation has actually set in. To avoid the risk of this very fatal disease, great care should be exercised in all wounds of the head, even where the injury may seem to be of a slight character.

*Simple idiopathic meningitis* is met with most frequently in persons under the age of twenty, and it may be induced by prolonged exposure to the sun, great excitement, as a consequence of any severe shock, or as a sequence of some acute febrile disease. Its onset is generally marked by acute pains in the head, which are followed by nausea, vomiting, shivering fits, followed by heat and flushing, delirium, stupor, and insensibility. Treatment is much the same as that already indicated in *traumatic meningitis*.

**MENIPP'OS**, a Syrian slave from Lebanon, became a pupil of Diogenes the Babylonian, head of the Stoics, after he had worked out his freedom. Cynic though he was by profession, he amassed great wealth as a money-lender, but lost it all on one great speculation and at once committed suicide, B.C. 60. He was the bitterest satirist, especially of his brother philosophers, that the ancients knew, so Lucian tells us. Varro's satires were an avowed imitation of Menippus, and were called *Menippeæ*. In like manner any very biting sarcasm comes to be called *Menippean*.

THE SATIRE *MÉNIPPÉE* of mediæval France takes its name from this old railler. It appeared in 1594 when the "Ligue" was at its height, and its serious object was to bring that fanatical body into derision, so that France might settle into peace again and agree to differ (as to Huguenots and Catholics) on religious matters. Many writers took part in it. It professes to be an account of the meeting of the states-general at Paris, and gives a burlesque of the opening, with clever exaggerated parodies of the speeches of the seven chief leaders (except as to the tiers-état speaker, who is quite serious, and delivers a splendidly severe comment on the times and a paenegyric on Henry of Navarre). It had an immense effect at the time, and remained long a favorite piece, so that Butler took it as model for his "Hudibras" seventy years later.

**MENISCUS** (Gr. *méniskos*, a crescent, diminutive of *ménê*, the moon), a kind of lens having one convex surface and one concave, the radius of the former curve being the shorter; it acts as a convex lens, bringing parallel rays of light to a focus.

**MENISPERMACEÆ**, an important and extensive order of plants, belonging to the *POLYPETALÆ*, cohort Ranales. *Menispermaceæ* are usually bitter and tonic plants. Several species of *Cocculus* are used in their native countries as a remedy for intermittent fevers. *Jateorhiza palmata* furnishes the *CALUMBA* ROOT of the shops, a valuable bitter. The roots of species of *Cissampelos* are administered in cases of snake-bites. *COCCULUS*

berries, the fruits of *Anamirta paniculata* are used in India to take fish by stupefying them. They are sometimes used to adulterate beer.

In this order the male and female flowers are on separate plants. There are six sepals in a double series, and the petals are arranged in the same way. There are six stamens, opposite the petals on the receptacle. There are usually three carpels, each with one ovule, fixed in a peltate manner, with a superior micropyle. The stem is generally woody, and climbing or twining; the leaves are alternate, without stipules.

**MENISPERMINE**, an alkaloid found with picrotoxin in the seeds of *Menispermus cocculus*, natural order Menispermaceæ. It crystallizes in white prisms, which melt at 120° C. (248° Fahr.) It is insoluble in water, but soluble in alcohol and ether. The formula is  $C_{18}H_{12}NO_2$ . It is not poisonous, and is employed in medicine as an alternative, tonic, laxative, diuretic, and stimulant, in doses of from 1 to 5 grains.

**MENNONITES**, a religious community founded in Holland by Menno Simonis, from whom the sect takes its name. Noncombativeness is an essential principle of their religion, and in adhering thereto the Mennonites have made sacrifices which nothing short of strong conviction could induce—in fact, it has been the pivot of their history. About the time Luther proclaimed the fundamental articles of Protestantism in Germany, Menno took the same step in Holland, forming a society on the basis of baptism after spiritual maturity and of opposition to bearing arms. The Mennonites were immediately subjected to persecution by the government, and were driven from one country to another, till Paul of Russia finally offered them security in his kingdom. The Mennonite religion is a mixture of Quaker, Lutheran, and Baptist creeds, and more practical than abstract in its teachings. One of its leading disciples observes, "It is a religion for every day in the week," and its precepts and observances are made to touch every relation in ordinary life. They believe in the Trinity, a personal devil, and a veritable Hades of "fire and brimstone." They will not bear arms or take an oath; they do not suffer any one to become a public charge; and the member who lies, cheats, or steals is expelled. They have bishops, pastors, teachers, and deaconesses, but no salaries are paid the ministers, who have to maintain themselves and their families by daily labour.

The first Mennonite settlement in Russia dates back to 1790, when the "Chovitz" colony was formed, each family being granted a perpetual lease of 170 acres of land, together with sundry legal immunities and privileges, including exemption from military service, the establishment of their own breweries and distilleries, &c. Some years afterwards a special grant of about 80,000 acres of land was made to them, upon which the second colony, "Molotsbom," was founded. From these two colonies the Mennonites gradually spread over the country contiguous to the Black Sea, comprising three whole provinces. They infused fresh life into the old seaport of Odessa, prosperous cities sprang up to accommodate the business of the colonies, while compact settlements and villages, surrounded by grain fields, groves, and orchards, were to be seen on every hand. It was a miracle of thrift, and all Russia stood amazed at the spectacle. The celebrated Odessa wheat was brought to perfection by the Mennonites, and their principal industry was the production and exportation of this commodity.

In 1878, a change having been made in the military organization of the Russian Empire, by which all subjects were required to perform military duty without distinction, the Mennonites were informed they could either conform to the new arrangement, or seek homes in some other land within ten years. With heroic devotion to their faith they chose, rather than abandon an essential article of it,

to make new homes in a strange country, and the Canadian province of Manitoba was fixed upon as their future residence. The first migration thither was in 1874, and in 1880 the Mennonite population in Manitoba numbered no less than 6500. Their settlements are laid out with the same judicious care and forethought which distinguished them in Russia, and everything about their villages and farms is indicative of a happy, frugal, and superlatively industrious people. The arrangements with the Dominion government were, guarantees of exemption from military service, setting apart of tracts of land for their exclusive colonization, and a loan of 100,000 dollars at 6 per cent., repayment of which was guaranteed by their co-religionists in Ontario, who had settled in that province many years before.

**MENOBANCHUS** is a genus of amphibians belonging to the order URODELA, and family Proteidæ. This genus is confined to North America, where it is represented by two species. The Proteus of the Lakes (*Menobanchus maculatus*) is only found in Lake Champlain, the great lakes, and their tributary streams. It is about 12 inches long, and has an elongated, subcylindrical body, and a long compressed tail. The skin is smooth, permeated by many pores, and the colour is a dark cinereous gray, with somewhat circular spots of a darker hue irregularly dispersed. The head is large and flattened, and it has a wide mouth, covered by thick, fleshy lips. The eyes are small and placed far asunder, and the small nostrils are placed very near the margin of the upper lip. There are three gills on each side of the neck, which resemble fringe of the finest texture, are of considerable size, and, when the animal is alive, are of a fine, rich, crimson colour: they are in constant motion. The gills are persistent throughout life, and though lungs are present the animal cannot live long out of water. Four limbs are present, each foot having four toes without claws. This amphibian lives at the very bottom of the waters which it inhabits, where it swims or creeps along the ground with a slow serpentine motion. It feeds on various kinds of worms, insects, molluscs, and crustaceans. They are found during the spawning season, April and May, concealing themselves in the crevices of rocks, and are taken with the hook baited for cat-fish. The fishermen erroneously consider them poisonous. Another species, *Menobanchus lateralis*, is from the Mississippi and its tributary waters.

**MENOPOMA**. See HELLBENDER.

**MENSURATION** is the name given to a branch of the application of arithmetic to geometry, which shows how to find any dimension of a figure, or its area, or surface, or solid content, &c., by means of the most simple measurements of which the case will admit. Geometry itself originally grew, as its name shows, out of land-surveying; and mensuration is a return to this practical side of the great science. Trigonometry ascertains the values of lines and angles, and the teachings of trigonometry and of geometry form the bases for mensuration. Being a practical art it contains many rules for facilitating calculations, the chief being that the area of a rectangle is the product of its two sides (the result being in square inches, square feet, &c.); that the area of a triangle is half that of a rectangle on the same base and of the same altitude; that triangles and parallelograms on the same base and of the same altitude are equal, &c. As every surface can be divided into triangles, these rules provide for the measurement of all figures, the bases being measured by actual yard measures. [See BASE LINE.] So with cubic content. The content of a parallelepiped (a figure all whose sides are in parallel pairs, like a cube) is found by multiplying together the base, width, and height, which gives the product in cubic inches, and generally of such figures as prisms, cylinders, &c., by multiplying the area of the base (in square units) by the height (in linear units).

**MENTANA**, a small village of Italy, 18 miles N.E. of Rome, and about 2 miles from Monte Rotondo, on the road to Tivoli, stands on the site of the ancient *Nomentum*—whence the way through it was called the *Via Nomentana*. It is chiefly memorable as the scene of the total defeat of the Garibaldian insurgents, whose object was to make Rome the capital of Italy, by the combined French and papal troops on the 8rd November, 1867. This was the first occasion on which the Chassepot rifle was used in actual warfare. The French only lost twenty-two killed and 161 wounded, while the insurgents left 600 dead on the field.

**MENTHA** is a genus of plants belonging to the order *LAMIATÆ*. To this genus belong the MINTS, PENNY-ROYAL (*Mentha Pulegium*) and PEPPERMINT (*Mentha piperita*). The species are herbs, with the flowers in dense whorls. The calyx is five-toothed, generally regular; the corolla campanulate, with a short tube and a four-lobed limb; there are four erect, nearly equal stamens.

**MENTHENE**, a hydrocarbon obtained from menthol by the action of zinc chloride. It is a colourless liquid of agreeable odour, having a specific gravity of 0.851. The boiling point is  $163^{\circ}\text{C}$ . ( $325^{\circ}\text{Fahr}$ .) The formula is  $\text{C}_{10}\text{H}_{18}$ . It is insoluble in water, but is soluble in ether, turpentine, and wood naphtha. With chlorine it forms pentachloromenthene ( $\text{C}_{10}\text{H}_5\text{Cl}_5$ ); with bromine it forms bromomenthene ( $\text{C}_{10}\text{H}_{17}\text{Br}$ ).

**MENTHOL**, Menthyllic Alcohol, or Hydrate of Menthyl. This is the camphor of peppermint oil, from the *Mentha arvensis*, natural order Labiate; it is the stearoptene deposited in crystals from the oil on long standing. It is largely imported from Japan, and made up into menthol cones, a popular and efficient remedy for facial neuralgia. It melts at  $36^{\circ}\text{C}$ . ( $96^{\circ}\text{Fahr}$ .), and sublimes unchanged at  $210^{\circ}\text{C}$ . ( $410^{\circ}\text{Fahr}$ .) It is slightly soluble in water, very soluble in alcohol, ether, and the oils. The formula is  $\text{C}_{10}\text{H}_{20}\text{O}$ . With hydrochloric acid it forms chloride of menthyl ( $\text{C}_{10}\text{H}_{19}\text{Cl}$ ). It also forms similar bromides and iodides. It is an alcohol containing the radicle menthyl ( $\text{C}_{10}\text{H}_{19}$ ). It is much used in medicine, internally as a diffusible stimulant, and externally as an anæsthetic. Applied topically to the skin it affects the nerves like aconite, deadening neuralgic pains, and it has the advantage of being non-poisonous. It is also an antiseptic. It is applied in the form of a moulded stick, which melts when rubbed gently on the painful part.

**MENTONE**, a town of France, in the department of Alpes Maritimes, situated 12 miles E.N.E. of Nice, in a sheltered nook, with a noble semicircle of mountains guarding it closely towards the north, from the slopes of which the rocky, irregular coast of the island of Corsica is seen standing boldly out in the distance, while to east and west the slopes are clothed with citron and olive groves, and tracts where flowers blossom nearly the whole year round. The town has some trade in oil and lemons, the produce of its territory. It has a clean, neat appearance, and a look of more prosperity and comfort than most of the towns of the Riviera. It consists of two portions, called the East and West Bays, divided by a projecting promontory, on which stands an old Genoese fort. It has become a favourite winter resort, on account of the salubrity of its air and the mildness of its climate. Mentone was transferred from Monaco to France in 1860. The population in 1882 was 8608.

**MENTZE**. See *MAIZZ*.

✧ **MENYANTHIN**, a bitter principle obtained from the Buck-bean (*Menyanthes trifoliata*), natural order Gentianaceæ. It is an amorphous colourless powder of intensely bitter taste. It is soluble in hot water, alcohol, and in alkalis, but insoluble in ether; and is also soluble in the ordinary acids, giving coloured solutions. The formula is  $\text{C}_{22}\text{H}_{36}\text{O}_{11}$ .

**MEPHISTOPHELES**, in the legend of Faustus, is the name given to the evil spirit who attends the doctor as his servant for the period of the compact, and who at the end destroys him and carries away his soul. The origin of the name, which is spelt in two or three different ways in the oldest versions of the story, is doubtful; for while some authorities see in it a barbarous Greek compound, *mē-phosto-philos*, not loving the light, others would derive it from the Hebrew words *mephir*, destroyer, and *tophel*, liar. In Marlowe's tragedy of "Faustus" Mephistopheles appears as one of the servants of Lucifer, the prince of darkness, and though, in accordance with the then current versions of the legend, he is concerned in the performance of a number of fantastic, rudely humorous tricks, he never forgets that he is a fallen spirit, and there are elements of sorrow and sternness in his character. At the present day, however, when the name is mentioned it is neither of the mediæval conception nor of that of the English poet that we think, but rather of the wonderful creation of Goethe, whose Mephistopheles is emphatically the devil of the nineteenth century. "The devil had played an important part in mythology in all times. Goethe . . . stripped him of mythologic gear, of horns, cloven foot, harpoon tail, brimstone, and blue-fire, and instead of looking in books and pictures, looked for him in his own mind, in every shade of coldness, selfishness, and unbelief that, in crowds or in solitude, darkens over the human thought—and found that the portrait gained reality and terror by everything he added and everything he took away. He found that the essence of this hobgoblin, which had hovered in shadow about the habitations of men ever since there were men, was pure intellect applied, as always there is a tendency, to the service of the senses; and he flung into literature, in his Mephistopheles, the first organic figure that has been added for some ages, and which will remain as long as the Prometheus" (Emerson). See also *FAUSTUS* and *GOETHE*.

**MERBECKE**. See *MATTHEE*.

**MERCANTILE SYSTEM**, an exploded theory of the older political economy, resting upon the absurd idea that the exports of a flourishing country must bear a money value greater than the imports. If the contrary is the case it was said that the balance of trade was *against* the country, and the excess of imports had to be paid for in cash, thus draining the country of its money.

The fallacy lies, first, in regarding money as the only form of wealth, and secondly in assuming that a balance of trade must be settled in cash one way or the other. As regards the latter, let £100 of goods be sent to Paris at a charge of £5, and sold at a profit of £5; the Paris house has £110 in hand. Let gloves be bought with this and sent to London, paying £5 charges. Here is a case of £115 of imports appearing against £100 of exports, and yet no cash at all need have passed. This is only one case out of many. As regards the first fallacy, it is set at rest by the question, "How is a country to become richer by trading if it does not take in more than it gives out?"

**MERCAPTAN** (*Mercurius captans*), a name usually given to sulphhydrate of ethyl. See *ETHER*.

**MERCATOR**, **GERARD** (whose real name was Kaufman, of which *Mercator* is the Latin equivalent), was born at Rupelmonde in East Flanders, in the year 1512. He applied himself with great industry to the sciences of geography and mathematics, was patronized by the Emperor Charles V., and appointed in 1559 cosmographer to the Duke of Juliers. His name is given to the method of geographical projection now usually employed in the construction of nautical maps, in consequence of his having first represented the meridians by equidistant parallel lines, and the parallels of latitude by straight lines at right angles to the meridian, but he did not know the distance which ought to separate these parallels. [See

MAR.] The credit of first investigating the principles of that projection, and applying them to the purposes of navigation, appears to be due to Edward Wright, who explained them in a treatise published in 1599. Gerard Mercator died at Doesburg, 2nd December, 1594.

**MERCHANT GUILDS.** See GUILDS and LIVERY COMPANIES.

**MERCHANTS, STATUTES OF.** In ancient England the laws of Edward the Elder provided that "if a merchant throve so that he fared thrice over the sea by his own means, then was he thenceforth of thegnright worthy," whence the legend of Whittington arose later on. Ethelbert made further laws as to the merchants, and from time to time edicts were issued, till at length in Magna Carta (s. 41) it is once for all provided that "all merchants shall have safe-conduct to depart from or enter England, to stay in or go through England either by land or by water, to buy and sell without any evil tolls, according to old and right customs, except in times of war. In case of war foreign merchants are to be detained safely until it is seen how the English merchants in the enemy's country are treated." Henry III. gave these foreign (German) merchants great privileges by proclamations. It is, however, to Edward I., the English Justinian, that we owe the foundation of our trading rights on their present basis, as we owe so many things besides. The famous Statute of Merchants was passed at Aetion Burnel in 1283, giving proper facilities for the recovery of merchants' debts by distraint and imprisonment, and defining their status and privileges. This was confirmed in 1285, and again by the Lords Ordainers, who controlled Edward II., in 1311. Edward I. passed his Statute of Foreign Merchants in 1297. He managed to extort from these what he dared not get from the English—certain customs and grants of money in payment for further charters of privileges; as, for instance, for the Carta Mercatoria of 1303.

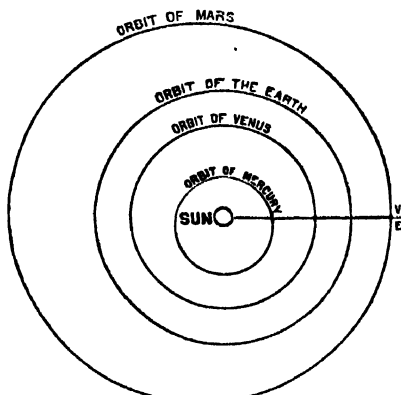
**MERCIA** was one of the chief kingdoms formed after the English conquest of Britain. It was roughly outlined by the old diocese of Lincoln as it used to be some years since. It was one of the latest kingdoms to be formed, as was natural from its inland position, the invaders being essentially pirates and sea rovers. Mercia, in fact, grew from the amalgamation of many petty chieftaincies or small kingdoms, and came to include also all Wessex north of Thames. Its name signified the march or frontier, and its borders marched with those of the Britons of Wales. The chief components of Mercia were the Lindesfarns and Gains in Lincolnshire, the Magesstas in Herefordshire, and the Hwiccas in Gloucestershire, Worcestershire, and Warwickshire, and some modicum of independence was long retained by these under the central sway of the Mercian king. All these tribes were Anglians, except the Hwiccas, among whom were some Saxons. Mercia came at one time to be the principal state in England under Penda and Offa, before Wessex had attained the supremacy.

**MERCURY** (Lat. *Mercurius*), the ancient Roman god of traffic, whose name comes from the same root as *Mercator*, the merchant, was one of the best worshipped gods of the Italian peninsula. Hardly a street was to be found without his shrine. His great temple was at Rome, and was built near the Circus Maximus as early as B.C. 405. Later he became identified with the Greek god Hermes, and lost his practical Roman character and attributes—a great absurdity, as the two divinities had scarcely anything in common. The most reasonable explanation is that the Romans, wishing to identify twelve of their chief gods with the twelve Greek Olympian deities, had to make Mercurius into Hermes, because all the other thrones had received their occupants.

**MERCURY.** We refer to the article SOLAR SYSTEM for a general account of the position and elements of Mercury. We here give the further details with respect to

this planet which appear to be of special interest. Mercury is the nearest planet to the sun, unless future research should substantiate the existence of the interior planets which have been sometimes suspected. The mean distance of Mercury from the sun is about 40,000,000 miles, and its diameter is about one-third the diameter of the earth. Mercury is easily seen with the naked eye at favourable times, provided the observer is not in too high a latitude. The difficulty of seeing Mercury arises from the fact that it seldom sets more than an hour and a half after the sun or rises more than that length of time before the sun. The best time for seeing Mercury is in the evening twilight, about three-quarters of an hour after sunset, the spring being more favourable than the autumn.

The planet Mercury is one of the smaller members of our system. Mars is the only one of the principal planets which can be compared with it in bulk. The diameter of Jupiter is more than thirty times as great as the diameter of Mercury, yet the brilliancy of Mercury has been known (e.g. in February, 1868) to rival that of Jupiter in splendour. This is partly due to the proximity of Mercury to the sun, its distance therefrom being only one-fourteenth part of the distance by which Jupiter is separated from the sun. It follows that the brilliancy with which the surface of Mercury is illuminated by the sun must be much greater than the extrinsic brilliancy of Jupiter. Besides this, the earth is much nearer to Mercury than to Jupiter. The eccentricity of the orbit of Mercury is very remarkable; in fact the greatest and least distances of Mercury from the sun are respectively 43,000,000 and 28,000,000 miles, or very nearly in the rate of three to two. The period of its revolution is eighty-eight days, and the period of the ap-



parent cycle of changes with respect to Mercury and the sun averages 116 days. Once during each period of 116 days Mercury is at its greatest elongation east, and then in about forty-eight days afterwards the planet has moved to its greatest elongation west. The actual amount of the elongation is from 17 to 28 degrees.

Viewed through a telescope Mercury shows phases like the moon. At the greatest elongation the planet appears like a half-moon, and when nearly between the sun and the earth the diameter is 10 or 12 seconds, but only a thin crescent can be seen. It is very difficult to scrutinize the actual surface of the planet, as it can only be seen in daylight or close to the horizon in twilight. It has, however, been thought that Mercury rotates on his axis once every twenty-four hours and five minutes, but the estimate must be received with considerable caution.

Transits of Mercury across the sun's disc, if of less interest than transits of Venus, are much more frequently seen. The average interval between the transits of Mercury is less than ten years, and the longest interval is

thirteen years. The transits of Mercury for the remaining part of this century occur on 10th May, 1891, and 10th November, 1894.

**MERCURY or QUICKSILVER** (Lat. *hydrargyrum*, symbol Hg, equivalent 200, specific gravity 18'6) is one of the so-called noble metals, remarkable for being fluid at ordinary temperatures; it boils at 660° Fahr., giving off vapour of specific gravity 6'976, and may therefore be distilled; it is solid at -40° Fahr., contracts at the moment of congelation, and becomes ductile. It is of a silvery white colour, with a striking metallic lustre. In consequence of the uniform rate at which it expands when heated, from considerably below 0° to above 800° Fahr., it is employed in the construction of thermometers. Mercury when pure runs in small spherical drops over smooth surfaces; but when impure the drops become elongated and *tailed* in form, and leave a gray stain on porcelain or glass. It is a good conductor of electricity, and has a low capacity for heat.

The mercury imported into this country is commonly contained in iron bottles secured by a screw in the opening, and is usually almost chemically pure. If the presence of other metals is suspected it may be pressed through chamois leather to separate mechanical impurities, re-distilled, and then digested for a few days in dilute cold nitric acid, which exerts little action on the mercury if more oxidizable metals are present. It is then freed from the nitric acid by washing with distilled water, and is finally dried either by heat or by passing through it clean bibulous paper, when it becomes pure chemically and mechanically. The quantity of mercury imported into the United Kingdom in 1884 was 4,497,748 lbs., value £333,918. Nearly the whole came from Portugal and Spain. In the same year there were re-exported from Great Britain 3,384,616 lbs., value £285,817, chiefly to Hamburg, Bremen, France, India, and China.

The mercury of commerce is entirely obtained from *cinnabar*, its principal ore, which is a bisulphide of mercury, known also as *vermilion*, of a brownish-red colour, massive, and sometimes crystalline. The substance of this latter name used as a pigment, is a sulphide of mercury, but is more frequently an artificial product. It is also found, although rarely, as a *chloride* (which is a grayish translucent substance), and as an *iodide* and a *selenide*. Native or virgin quicksilver occurs only in small quantities, and in cavities of the sulphur ores. Native amalgam, or a compound of mercury and silver, is a white opaque substance, generally crystallized in cubes.

The mines occur in comparatively few places; those of Almaden in Spain, and Idria in Carniola, are the most important. The ore is to be found in upper Hungary, Transylvania, and the district of Zweibrücken in Germany, and it is procured also from the Ludwig mine near Wetzlar, and from the Val Sassina in Lucina. It is found also in China and Japan, and in Chili and Mexico. Mercury is also now obtained in yearly increasingly large quantities from California.

There are two methods of reducing the metal from its ore. The *cinnabar* may be burned in a furnace, in which case the sulphur is given off as sulphurous acid and the mercury is collected in a condensing chamber; or the sulphur may be separated by the action of slaked lime or iron filings, which re-agents, with the ore, are put into cast or sheet iron or earthenware retorts; and the metal on being set free, and volatilized by the heat, is condensed by cold.

Mercury forms several important alloys with other metals called amalgams, some of which are liquid and others solid. It is employed for the extraction of gold by amalgamation from quartz rocks, which contain minute quantities of the precious metal. This amalgam is found native in California. It is solid and white. It is employed in gilding. Silver, zinc, copper, and cadmium amalgams are used in stop-

ping teeth. Silver amalgam is found native. Sodium and potassium both form amalgams with mercury. A remarkable amalgam, called ammonium amalgam, is formed by the action of sodium amalgam on an ammonium salt. It is extremely bulky, and lighter than water. It quickly decomposes into mercury, hydrogen, and ammonia. Tin amalgam is employed most extensively in the silvering of mirrors.

There are two oxides of mercury, mercuric oxide (HgO) and mercurous oxide (Hg<sub>2</sub>O). Mercuric oxide, or red oxide, or red precipitate, is obtained by heating mercury for some time in contact with air, or by precipitating a mercuric salt by an alkali. It is highly poisonous, and is decomposed by strong heat into mercury and oxygen gas.

Mercurous oxide or suboxide, or gray oxide of mercury, can be obtained by digesting calomel in solution of caustic alkali. It is a dark gray insoluble powder, which is decomposed by the action of light into the red oxide and mercury.

There are two important chlorides of mercury, mercuric chloride (HgCl<sub>2</sub>) and mercurous chloride (Hg<sub>2</sub>Cl<sub>2</sub>). Mercuric chloride or corrosive sublimate is a very poisonous compound, usually obtained by sublimation from a mixture of mercuric sulphate and sodium chloride. It is a heavy white crystal of specific gravity 5'43; it melts at 265° C. (509° Fahr.), and boils at 295° C. (563° Fahr.). It is very soluble in hot water, crystallizing in needles on cooling. It is also soluble in alcohol and ether. It forms an insoluble compound with albumen, and this is therefore the best antidote in cases of poisoning. It is strongly antiseptic, and particularly fatal to bacteria. It has recently been introduced and largely employed by Sir Joseph Lister in the dressing of wounds by his antiseptic treatment. A solution of 1 part in 1000 parts of water is employed.

Mercurous chloride is well known as calomel. It is usually prepared by sublimation from a mixture of mercuric sulphate, mercury, and sodium chloride. It is a white, heavy, tasteless powder. It is at once decomposed by an alkali, mercurous oxide being formed. It is largely used in medicine as an alterative.

There are also two iodides of mercury, mercuric iodide (HgI<sub>2</sub>) and mercurous iodide (Hg<sub>2</sub>I<sub>2</sub>). Mercuric iodide, or red iodide of mercury, is a brilliant scarlet powder, obtained by precipitating mercuric chloride solution with potassium iodide. It can be prepared in large crystals by sublimation. It is a most virulent poison, and in small doses a very powerful alterative, employed in medicine in cases of syphilis. It is known also as a pigment under the name of Chinese Vermilion. This iodide presents a curious instance of dimorphism, accompanied by change of colour. When heated it becomes yellow, but on touching it with a hard cold body it is instantly changed to the red modification.

Mercurous iodide, or yellow iodide of mercury, is formed by precipitating mercurous nitrate by potassium iodide. It may also be obtained in large crystals by sublimation.

There are two bromides of mercury, mercuric bromide (HgBr<sub>2</sub>) and mercurous bromide (Hg<sub>2</sub>Br<sub>2</sub>); both are crystalline, white, or yellow bodies, which sublime unchanged.

There are two nitrates of mercury, mercuric nitrate (Hg<sub>2</sub>NO<sub>3</sub>H<sub>2</sub>O) and mercurous nitrate (Hg<sub>2</sub>2NO<sub>3</sub>2H<sub>2</sub>O), both soluble crystalline salts.

Mercuric sulphate (HgSO<sub>4</sub>) and mercurous sulphate (Hg<sub>2</sub>SO<sub>4</sub>) are crystalline salts; the latter is slightly soluble in water. The former is decomposed by it, forming an insoluble yellow basic compound known as Turpeth Mineral (8HgO,SO<sub>3</sub>).

Mercuric sulphide (HgS) occurs native as *cinnabar*, but it is largely prepared artificially by subliming a mixture of mercury and sulphur, and is then known as *vermilion*, a valuable scarlet pigment. When first sublimed it is a dark red mass, but the scarlet colour comes out on reduc-

tion to a very fine powder, the intensity of the colour increasing with the fineness of the powder.

Mercurous sulphide ( $\text{Hg}_2\text{S}_2$ ) is a black powder. The fulminate of mercury, so largely used in percussion caps, has been already described. [See **FULMINATING MERCURY.**]

Mercuric cyanide ( $\text{Hg}_2\text{CN}$ ) crystallizes in white prisms, and is used as a source of cyanogen. It is very poisonous.

Mercuric ethide, or mercury ethyl ( $\text{Hg}_2\text{C}_2\text{H}_5$ ), is an organo-metallic body. It is a colourless liquid, boiling at  $159^\circ \text{C}$ . ( $318^\circ \text{Fahr.}$ ) It burns with a smoky flame, giving off a large quantity of mercurial vapour.

All mercury compounds are volatilized or decomposed by heat. The metal is precipitated from its solutions by copper. Hydrogen sulphide produces a black precipitate insoluble in ammonium sulphide.

The mercuric salts are further distinguished by giving a yellow precipitate with caustic potash, a white with ammonia, and a scarlet with potassium iodide. The mercurous salts give a white precipitate with hydrochloric acid, which is turned black by ammonia, a black precipitate with caustic potash, and a yellow precipitate with potassium iodide.

Being the only metal fluid at ordinary temperatures, mercury is much used in philosophical instruments, especially in the thermometer for the registration of heat, the barometer for indicating the pressure of the atmosphere, and in the apparatus known as Sprengel's Pump, employed for exhaustion of high *vacua*. In the chemical laboratory it is in constant use, especially in the collection, condensation, and analysis of various gases.

The mercurous salts generally are not actively poisonous, but the mercuric salts are all virulent poisons.

**Medicinal Uses of Mercury.**—The use of mercury in connection with medicine was unknown to the Greeks and Romans, and although it was used externally in certain affections of the skin by the Arabian physicians, it was not until the middle of the sixteenth century that it came into favour as an internal remedy. Since then it has held a prominent place as a medicinal agent, and although the estimate of its value has passed through many fluctuations, it is still one of the most valuable drugs at the disposal of the modern physician. In its metallic form it was formerly used in large quantities, in the hope that its weight and mechanical action would enable it to overcome obstruction of the bowels, but this generally useless practice has long been given up. At the present day the chief preparations of the drug in its metallic form exhibit it in a state of extremely minute subdivision, and consist of blue pills (*pilula hydrargyri*), gray powder (*hydrargyrum cum creta*), and blue ointment (*unguentum hydrargyri*). Blue pill is made by rubbing together mercury, confection of roses, and powdered liquorice root, and it is at once the oldest and the most extensively used of all the mercurial preparations for internal use. Gray powder consists of one part by weight of mercury and two parts of prepared chalk, the mixture being triturated until the metallic globules have wholly disappeared and the whole has acquired a uniform gray colour. Blue or mercurial ointment is made up of mercury, lard, and suet, and mercurial plaster contains also about one-third of its weight of metallic mercury as its base. Calomel (*hydrargyri subchloridum*) is prepared from the sulphate of mercury, and is a heavy, white, tasteless powder, insoluble in water, ether, or spirit. One of the mildest preparations of mercury it is largely used internally, and when suspended in lime water it forms the liniment known as the *black-wash*. Corrosive sublimate, or the perchloride of mercury, occurs in the form of a heavy, semitransparent, crystalline mass, soluble in water, and more freely still in alcohol or ether, having a strongly metallic taste. It is a powerful irritant poison, but when given in small doses, varying from one-hundredth up to one-eighth of a grain, it forms a most valuable medicine for internal use. Suspended in

lime water it forms the external application known as the *yellow-wash*. The red iodide of mercury, obtained by precipitation from the combined solutions of mercuric chloride and potassium iodide, is a crystalline powder of a bright vermilion colour, insoluble in water, but soluble in alcohol and ether. It is a powerful preparation, resembling corrosive sublimate in its action on the system. The green iodide of mercury is obtained by the direct combination of iodine and mercury, in the form of a heavy greenish-yellow powder, insoluble in water or alcohol, but soluble in ether. It is chiefly employed to produce the constitutional effect of mercury, and it is sometimes made up into an ointment. White precipitate of mercury, or ammoniated mercury, is obtained by precipitating corrosive sublimate by ammonia. An opaque white powder, insoluble in water, it is never used internally, but is made up into an ointment for the destruction of parasitic insects, and as an application for some diseases of the skin. Red oxide of mercury, also known as red precipitate, is usually seen as bright red crystalline scales, and it is used only as an external application. Nitrate of mercury, made by dissolving mercury in nitric acid, is used to make a powerfully caustic solution, and in the preparation of the citrine ointment.

Blue pill, calomel, and gray powder are used in many affections of the digestive apparatus. They exert a special influence upon the liver, and promote the expulsion of bile from the body. Gray powder is especially valuable as a mild and efficient aperient for children, and it is often given to cure persistent vomiting in diarrhoea and in infantile cholera. In the case of chronic diarrhoea in adults small and oft repeated doses of corrosive sublimate are found more effective, and until quite recently it was a favourite remedy for tropical dysentery. Calomel is a useful remedy in biliousness, but like other preparations of mercury its use must not be persisted in beyond due bounds. In skin diseases mercurial preparations are largely used, and the drug may be used either as a caustic, a stimulant, or as a soothing application. The acid nitrate of mercury is used as an escharotic in some forms of lupus, and sometimes also for the removal of warts and other small growths on the body. A little of the red oxide of mercury in combination with zinc ointment is often useful in cases of eczema, and the ointment of nitrate of mercury possesses most valuable detergent and stimulant properties, rendering it extremely useful in herpes, porrigo, psoriasis, and some other chronic skin diseases, while it is almost a specific for some forms of ophthalmia. Calomel ointment is of a soothing character, and it is employed to allay the itching attendant upon some eruptions on the skin; it is one of the best remedies known for the annoying itching of the anus from which many persons suffer. Mercury was formerly regarded as possessing great power over inflammation, and it was largely used in all inflammatory affections. This power is now regarded as being very doubtful, and except in cases of iritis, peritonitis, and some affections of the heart, it is rarely used to reduce inflammation. It still maintains its reputation for the treatment of syphilis, and notwithstanding its many disadvantages, it is by far the best remedy at present known for this disease.

When mercury is taken in large quantities or for a long time it produces a peculiar effect known as salivation. The common and leading symptoms of this are a metallic taste in the mouth, an undue flow of saliva, reaching in extreme cases to several pints daily, sponginess, swelling, and ulceration of the gums, a swelling of the tongue, loosening of the teeth, factor of the breath, and disease of the jaw-bones. At the same time much debility is felt, the flesh wastes, the blood is impoverished, and when not arrested the condition leads on to death from exhaustion. Formerly mercury was used to the point of salivation in the treatment of many diseases; but now a milder practice



prevails, and as soon as the gums become tender it is taken as a sign to reduce the dose, or to stop the administration of the medicine until the system has had time to recover.

**MERCURY ORES.** Almost the only commercial source of mercury or quicksilver is cinnabar or the sulphide of the metal ( $\text{HgS}$ ), but associated with this it also occurs native in considerable quantities; and besides occurring in native amalgam (combined with silver) it is found in the rare native calomel and in some gray copper ores, as well as in combination with iodine, selenium, and tellurium.

Cinnabar has the same composition as the artificial product vermilion. When pure it contains 86.2 per cent. of mercury; it is usually found in red earthy-looking masses, with a specific gravity of about 9, and hardness slightly above 2.

The Spanish mines have been wrought for upwards of 2000 years. Pliny mentions them as at work 700 years *n.c.* Those of Idria were discovered in 1497 A.D., and the Californian mines about 1855.

Cinnabar is very easily reduced. When heated in contact with air the sulphur is oxidized ( $\text{HgS} + \text{O}_2 = \text{Hg} + \text{SO}_2$ ), and the reduced mercury, volatilizing, is condensed in proper receivers. At Almaden, in Spain, a very crude process is adopted: the vapour of mercury and the sulphuric dioxide are passed through a series of vessels—aludels—like bottomless bottles, the neck of one being inserted into the base of the next, in which the metal condenses and is subsequently collected. This is a very wasteful arrangement, owing to leakage at the numerous joints; and a large amount of manual labour is required to collect the mercury and rearrange the aludels, which number about 600 for each furnace. At Idria the vapours are condensed in a series of masonry chambers. At other places the ore, mixed with lime, is heated in an iron or earthen bottle-shaped vessel—cucurbit—when the mercury distils off, sulphate and sulphide of lime being formed in the cucurbit. An improvement on this is effected by arranging the retorts after the fashion of those used in the manufacture of coal-gas.

**MERES, FRANCIS, M.A.**, unconsciously earned himself immortality when in 1598 he published "Palladis Tamia," or "Wit's Treasury," being the second part of "Wit's Commonwealth." The book is very absurdly written in the euphuistic style, but is inestimable now as containing a catalogue of Shakspeare's works which had appeared at that date. The famous passage runs thus:—"The sweete wittie soule of Ovid lies in mellifluous and honey-tongued Shakspeare, witness his 'Venus and Adonis,' his 'Lucrece,' his sugred 'Sonnets' among his private friends, &c. As Plautus and Seneca are accounted the best for comedy and tragedy among the Latines, so Shakspeare among the English is the most excellent in both kinds for the stage. For comedy, witness his 'Gentlemen of Verona,' his 'Errors,' his 'Love's Labor's Lost,' his 'Love's Labour's Wonne' (probably 'All's Well that Ends Well' is here meant), his 'Midsummer's Night Dreame,' and his 'Merchant of Venice'; for tragedy his 'Richard the 2,' Richard the 3,' 'Henry the 4,' 'King John,' 'Andronicus,' and his 'Romeo and Juliet.' As Epus Stolo said that the Muses would speake with Plautus' tongue if they would speake Latin, so I say that the Muses would speake with Shakspeare's, for fine-filed phrase, if they would speake English."

In the blank darkness which spreads over Shakspeare's career, and the doubts which perpetually arise as to the order of his work, this brief paragraph stands almost alone, beyond the edition of the poet's plays published by his fellow-actors. Indeed "Andronicus" almost rests upon this passage for its claim to authenticity, so little of Shakspeare would it otherwise seem to contain.

**MERGANSER** (*Mergus*) is a sub-family of *Anatidæ* or *Ducks*. In the mergansers the bill is longer,

more slender, and more cylindrical than in the ducks; each mandible is furnished along its edge with small, pointed, saw-like teeth, directed backwards; the tip of the upper mandible is hooked. In their general aspect and plumage these birds approach the true ducks (*Anatidæ*), but their gizzard is less muscular, and the intestinal canal and its cæcal appendages are shorter. The head bears a more or less developed crest. The mergansers frequent both inland waters and the sea-shores, and are chiefly confined to the northern parts of the world. They swim well, but from the weight and flattened form of their bodies appear deeply immersed in the water, the head, neck, and back only being visible. They are also excellent divers, moving beneath the surface with great rapidity and to a great distance at a time in pursuit of the fishes which form their prey. Their flight is strong and swift, and they have great endurance on the wing, but from the shortness and backward position of the legs are awkward upon land. The males after pairing time are subject to a partial change in the colour of their plumage.

The Goosander (*Mergus merganser*), the largest of the subfamily, is a common bird in the northern parts of both



Goosander (*Mergus merganser*).

hemispheres; but in this country it is usually seen only in winter, though it breeds in some parts of Scotland. The plumage of the male bird during the breeding season is very beautiful, the head being a dark glossy green, the breast salmon-coloured, and the upper surface and wings black and white. The ordinary plumage of the male, and that of the female at all seasons, is duller, the head being reddish-brown, the upper parts grayish-brown, and the under surface white. The bill and feet are reddish-orange. The nest is placed in the stump of a hollow tree or under a rock. The Red-breasted Merganser (*Mergus serrator*) resembles the goosander generally in its plumage, but the male in the breeding season has the upper portion of its breast red, with black streaks. It has a more southern range, and breeds in Scotland. The Smew (*Mergus albellus*) is a beautiful bird, the nuptial plumage being white with black crescentic markings. It is much smaller than the preceding species, with which it agrees in distribution. The Hooded Merganser (*Mergus cucullatus*) has a broad crest with a large white patch on each side of it. It is a native of North America, but has occasionally found its way to our shores.

**MERIDIAN CIRCLE.** The meridian circle is the great measuring instrument by which the work of surveying the heavenly bodies is chiefly accomplished. Until the last few decades observatories were generally supposed to be incomplete until equipped with the instruments known as the transit instrument and the mural circle. In the older books on astronomy these instruments are fully described, but of late years a change has taken place. The two instruments are now combined into one, to which



the name of *meridian circle* is usually given. By a single observation with the meridian circle we obtain the two elements of the position of a celestial body—viz. its right ascension and declination. All the great observatories have adopted the modern instrument, and one of the most approved forms of the meridian circle is shown in our Plate. It represents the instrument at Leyden erected by Messrs. Biot and Martin of Berlin. Instruments on the same pattern and by the same makers are found in Dunsink, and several other leading observatories.

The telescope is 6 inches in aperture and 8 feet long, and the diameter of the circles is 3 feet. The pivots rest in horizontal bearings due east and west, so that the telescope moves in a vertical plane coincident with the meridian. The circles are attached to the axis of the telescope, and they are read off by microscopes, which are supported by arms attached to the masonry piers on each side. The circles are graduated from  $0^{\circ}$  to  $360^{\circ}$ , and each degree is subdivided into thirty equal spaces, each of two minutes. The reading microscopes further subdivide each of these two minute spaces into 120 equal parts corresponding to seconds, and as the microscope can be read to the tenth of one part, it follows that the meridian circle really subdivides the circumference into tenths of a second. The two circles are exactly similar, and there are four reading microscopes placed at each side at right angles. A special piece of machinery (not shown in the Plate) enables the whole instrument to be lifted from its bearings, drawn from between the piers, turned round, and restored again with each pivot in the bearing previously occupied by the other. The mean of two observations made in the direct and the reversed positions is thus freed from certain instrumental errors. Counterpoises are provided which relieve the pressure of the instrument on the pivots. To illuminate the parts required to be read a lamp is fixed on a tube projecting from each pier; the light of the lamp streams along this tube through the pier, and at the other side it is received by suitable reflectors, which subdivide the light so as to carry a supply to each point where illumination is necessary, while still confining the rays so as not to interfere with the darkness which is necessary for observation. In the focus of the instrument a series of spider webs or of fine lines ruled on glass are adjusted. The transit of the celestial body is observed over the successive vertical wires. This was formerly done by the eye and ear method. Of late years an electrical method, known as the chronograph, has been introduced, by which, as the star passes each wire, the observer closes a key which makes a mark on a sheet of paper strained on a revolving drum. The sidereal clock also makes marks on the drum, and the comparison of the two determines the time of the transit. At the same time the observer by a slow movement places the telescope so that the star runs along a horizontal wire, and thus when the microscopes are read off the zenith distance is found. The zero of the circle is obtained by directing the telescope downwards on a basin of mercury, and then bringing the horizontal wire into coincidence with its reflection.

**MÉRIMÉE, PROSPER**, a distinguished French novelist, historian, and archæologist, was born at Paris, 28th September, 1803. His father, a painter of some note, and secretary to the *École des Beaux Arts*, gave him a good education, which he turned to advantage in the study of English and Spanish literature. In 1825 he published, under the pseudonym of Joseph L'Estrange, a series of studies for the theatre, which professed to be translations from the Spanish drama, under the title of "*Théâtre de Clara Gazul, Comédienne espagnole*." This work excited much attention, and it was received with much applause by the pioneers of the Romantic school, who had already commenced their famous conflict with the Classicists; but the promise it gave of dramatic ability was

never realized, and the talents of Mérimée found their scope in other directions. In 1827 he published "*La Guzla*," the results of some studies in Slavonic poetry, and soon after this he became a regular contributor to the *Revue de Paris* and the *Revue des Deux Mondes*, producing romances, novelettes, historical sketches, &c., in which he displayed great realistic power and the command of a clear vigorous style. After the revolution of July, 1830, he entered public life, and in 1834 was appointed inspector of historical monuments, in which capacity he visited many parts of France, and published his observations in a series of reports and some volumes of travels. His studies of Corsican life also enabled him to produce his greatest romance, "*Colomba*," which appeared in 1841. He then applied himself chiefly to historical research, publishing in 1844 his "*Études sur l'Histoire romaine*," and the same year he was elected a member of the French Academy. His "*Histoire de Don Pèdre I.*" was issued in 1848, and two years afterwards it was translated into English. In 1853 he was appointed a member of Senate, in 1858 president of the commission for reorganizing the Bibliothèque Impériale, in 1860 Commander of the Legion of Honour, and the same year a member of the Academy of Inscriptions. He died at Cannes in October, 1870. His "*Lettres à une Inconnue*" appeared posthumously in 1872, and the "*Lettres à une nouvelle Inconnue*" were published in 1875. A fresh series of letters, addressed to Sir Antonio Panizzi of the British Museum, were also published in 1881.

**MERINO** is a breed of sheep formerly confined to Spain, but now reared in Saxony, and introduced with success into Australia. The wool is celebrated for its length, fineness, and silky softness; it abounds in oil, so that the fleece generally looks dingy from the dust and dirt adhering to the outside. Wool is present on the forehead and cheeks. The horns are very large and spirally twisted. The skin of the neck is loose and pendulous. This breed has not been found profitable in England, as it owes all its value to the excellence of its wool, the carcase being worthless. See MESTA.

**MERIONETH**, so called after *Merion*, a British hero, a county of North Wales, is bounded N. by Carnarvonshire and Denbighshire, N.E. by Denbighshire, E. and S. by Montgomeryshire, S. by Cardiganshire, and S.W. and W. by Cardigan Bay, an inlet of the Irish Sea. Its greatest length, north-east to south-west, is 45 miles; its greatest breadth, north-west to south-east, is 30 miles. The area is 602 square miles, or 385,291 acres. The population in 1881 was 52,038.

**Coast Line and Surface.**—The northern part of the coast is formed by the estuary of which the Traeth Mawr and the Traeth Bach are portions. From the Traeth Bach the coast runs south about 6 miles past Harlech to the little headland on which stands the village of Mochraes or Mochras. The coast is skirted by sands dry at low water, and at some distance out to sea are three sandbanks, the "*Dutch Bank*," the "*Pontigal Bank*," and the "*Sarn Badrig*." This remarkable shoal runs from the immediate neighbourhood of the coast 22 miles out to sea in a south-west direction; it is composed of sand and gravel. It is dry at the ebb in spring tides, and in storms is marked by fearful breakers. From Mochraes the coast runs S.S.E. to Barmouth, and thence south to the Dovey and the Towy. There are few cliffs along the coast. Merioneth is the most mountainous of all the Welsh counties, and contains some of the loftiest peaks in North Wales. The *Berwyn Mountains* traverse the county from north-east to south-west, skirting the valleys of the Dee, the Wnion, and the Maw. Many of their summits are from 2000 to 3000 feet high. Cader Idris, though not the highest, is the most remarkable; its summit consisting of huge columns of crystalline greenstone, like the basaltic columns of the

**Giant's Causeway.** There are other mountain groups and offsets.

The county is almost entirely occupied with the slate rocks which predominate in North Wales. Along the valley of the Dee, as far up as Bala and the valley of the Elwen, a bluish-gray limestone is found, which is quarried for lime, the principal manure employed in the county. Great quantities of white limestone are quarried and burnt for lime near Corwen. Westward of the limestone the rocks are chiefly slaty, forming abrupt and rugged mountains of desolate appearance. Lead and copper mines are worked near Towyn at the mouth of the Disynwy, and copper mines near Barmouth; some gold is obtained by crushing the auriferous veins which traverse the primary rocks. There are slight indications of volcanic agency among the mountains.

The principal rivers belonging to the county are the Dee, the Maw, and the Dovey, with their respective affluents. The Dee rises near the Berwyn Mountains, and flows through Lake Bala into Denbighshire; it receives the Llew, Twrch, Glettwr, Alwen, and other small streams. The Maw, the Dovey, and the Disynwy all rise within the county, and, after receiving many small streams, fall into the Irish Sea.

There are many lakes, most of them small. The largest are Llyn-Tegid or Bala Lake, 12 miles in circumference, and abounding with trout, carp, and pike; and Llyn-y-Myngil. Merioneth is well supplied with railway accommodation.

The agriculturists of Merioneth are chiefly engaged in pasturage, grazing, and dairy farming, but tillage is extensively practised. Farming is still backward. Much of the land is mountainous, and extensive tracts are incapable of profitable cultivation; but the valleys are tolerably fertile. The chief crops are barley, oats, and potatoes. Cattle are kept in large numbers, and much care is given to the improvement of the breeds. It is, however, in sheep farming that the greatest progress has been made. The Merioneth sheep are small but hardy, with good meat-producing qualities and heavy fleeces, and more wool is produced in this county than in any other in Wales. **DOLGELLY** is the county town.

Merioneth is divided into six hundreds. It is in the dioceses of St. Asaph and Bangor. It is in the North Wales Circuit, and the assizes are held at Bala in the spring and at Dolgelly in summer. The county returns one member to Parliament. This county is the only division of the principality which retains its old British name, *Meirionnydd*. There are several traces of Roman works, and remains of camps exist near Bala.

**MERLE D'AUBIGNÉ, JEAN HENRI**, a popular historian of the Reformation, was born at Eaux-Vives near Geneva, 16th August, 1794. He was a descendant from an old Calvinistic family of Nîmes, and after being educated at his native place and at Berlin, he became pastor of the French Protestant Church in Hamburg. He remained at Hamburg in this capacity for five years, at the end of which he proceeded to Brussels, where he became chaplain to King William. After the revolution of 1830 he was invited by the king to return to Holland as tutor to the Prince of Orange, but declining the offer went to Geneva, where he assisted to establish a new college for the propagation of orthodox theology, in which he was appointed professor of church history. In this congenial position he remained until his death, which took place at Geneva, 21st October, 1872.

The great work of his life was his "Histoire de la Réformation au Seizième Siècle" (five vols., Paris and Geneva, 1835-85; 2nd edition, 1861-62). Written avowedly from an evangelical standpoint, this work displays a wide acquaintance with the subject, strong sympathy with the principles of the Reformation, and has all the ad-

vantages derived from an animated, picturesque, and eloquent style. In England and America it has been immensely popular, and some hundreds of thousands of copies of the English translation have been sold in these countries. A continuation of the history, entitled the "Histoire de la Réformation en Europe au Temps de Calvin" (three vols., Paris, 1868-65), and his "La République d'Angleterre aux Jours de Cromwell" (Paris and Geneva, 1849), though useful, have never obtained the celebrity of the earlier work.

**MERLIN** (*Falco asalon*) is the smallest of the **FALCONS** inhabiting Britain. It measures only 11 or 12 inches in length; the plumage of the back is of a fine bluish-gray colour; the wing primaries are quite black; the lower parts are reddish, with brown patches and streaks. In the female the back is reddish-brown, and the lower parts brownish-white. Notwithstanding its small size the merlin is so courageous and powerful that it has been known to strike and kill partridges at least twice its own weight; blackbirds and thrushes, and other small birds, are its common prey; and it was formerly trained to pursue



Merlin (*Falco asalon*).

these for the amusement of its owners. In the palmy days of falconry the merlin was the lady's hawk. Its nest, which is rude and scanty, is built upon the ground in rocky places or among heath; the eggs are four or five in number, and of a mottled reddish-brown colour.

This beautiful and daring little falcon is generally distributed through Europe, and extends its range in Asia as far as Nepal. It occurs also in North America (Lakes Huron and Superior), and a closely allied species, if not the same, is found in South Africa. In our island it breeds on the moors of some of our northern counties, and according to Mr. Eyton, on Cader Idris in North Wales.

**MERLIN**, a legendary British magician or wizard, who helped the natives of Britain to contend with their English invaders. Geoffrey of Monmouth names the fifth century as his epoch, and gives him a demon father. Merlin figures largely in Lord Tennyson's Arthurian epic, "Idylls of the King" and in Spenser's "Faerie Queene." There is also a Scottish (Border) traditional Merlin whose legends have a great resemblance to those of the British magician, but whose date is set a century later. Prophecies (probably not authentic) of both these Merlins exist, and like the legends are very similar to each other. No doubt the two traditions have a common origin.

**MEROPIDEÆ.** See **BERGATERS**.

**MEROVINGIANS.** See **FRANCE**.

**MERSEBURG**, one of the oldest towns of Saxony, and the chief town of a government of the same name, is situated on the Saale, 10 miles by railway S. by W. from Halle, and had 15,025 inhabitants in 1880. The most remarkable buildings are—a fine palace, now used for the government offices; the ancient cathedral, which has one of the largest organs in Germany; the cathedral school; the monastery of St. Peter, in the suburb of Altenburg; the palace

of Count Zechi, episcopal palace, school of surgery, the military hospital, and a town-hall. There are manufactories of various kinds, and extensive breweries and distilleries. It was at Merseburg, the "March town," that Henry the Fowler inflicted a great defeat on the Hungarians, A.D. 933.

**MERSEY**, a river of England, on the right bank of the estuary of which stands the great commercial port of Liverpool. Though not large, the Mersey has, from its flowing through the principal manufacturing district of the empire, and giving its name to the gulf or estuary between Lancashire and Cheshire, become, in point of commercial importance, second only to the Thames. It has its sources in the great central ridge, or Pennine chain, on the confines of Yorkshire, Cheshire, and Derbyshire. After receiving the Goyt from the south, and flowing west through Stockport, it is joined by its important affluent the Irwell. The latter, which has its source in the Lancashire moors, near Haslingden, flows south through Bury to Manchester, where, being joined by two smaller streams, it takes a westerly course, till its confluence with the Mersey. After being still further increased by the Boden from Macclesfield, the Mersey passes Warrington, a little below which it expands into a magnificent estuary, near its junction with the Irish Sea. The whole course is about 70 miles, with a breadth at the estuary of 16 miles, narrowing to from 1 to 3 miles in the channel. The permanent accessibility of Liverpool as a port depends upon the gulf-shaped form of this estuary. The rapid ebb current of the immense body of water thrown in by the tide has a great scouring power; and though the entrance channels often shift, deep passages are always kept open. The Dee estuary, on the other hand, is a bay; and the passage to Chester has been silted up, so that the construction of a large ship canal was rendered necessary some years ago.

**MERTHYR TYDFIL**, a town of Wales, in Glamorgan, situated 22 miles N.W. of Cardiff, and 189 from London by the Great Western Railway, is situated in a valley surrounded by lofty hills on the east bank of the river Taf. It is by far the largest town in Wales, and has advanced with extraordinary rapidity. At the commencement of the century it was a mere village: in 1881 it had 48,861 inhabitants, with iron and coal works which rank with the largest in the kingdom. The prosperity dates from the development of the coal and iron mines in the neighbourhood. The stratum of coal, which is of excellent quality, is accompanied with parallel veins of argillaceous iron, penetrating to a great depth, and yielding at an average about 35 per cent. of metal; and steel is now largely produced. The town of Merthyr consists chiefly of workmen's dwellings and small shops. The masters generally live at some distance, and the managers, overlookers, and higher officials of the various establishments reside in the suburbs, where some good residences have been built. The town is well drained and has a good supply of water, and it is now one of the most healthy manufacturing towns in Great Britain. There are several churches and chapels, schools, mechanics' institutes, temperance hall, theatre, court-house, banks, and a very fine market-place. The produce of the iron and coal mines is chiefly shipped at Cardiff. The first iron tramway in Great Britain was laid down from Merthyr to Cardiff in 1796—and on this, for a wager of £1000, Trevethick ran the first locomotive in 1804. The parliamentary borough—which has a population of 91,378—sends two members to the House of Commons. The name of the town is a corruption of *Martyr St. Tydfil*, a native princess traditionally said to have suffered death for her religion.

**MERTON COLLEGE, OXFORD.** This college was first founded at Malden in Surrey, in 1264, by Walter de Merton, bishop of Rochester and chancellor of England, who in 1274 removed it to Oxford. The buildings consist

of three courts. The hall was entirely recast, under the direction of Sir G. G. Scott, in 1872. The work included new windows, a new open timber roof, new west gallery, and completely new fittings. The chapel is also a parish church, dedicated to St. John the Baptist. It contains, among other monuments, that of Sir Thomas Bodley.

**MERTON, STATUTE OF**, a famous piece of early English legislation passed in 1236. Among other things it excused freemen from the attendance at both hundred and county courts, which had become very galling, and it also checked "frequent and vexatious writs of novel disseisin," which any one dispossessed of land might issue to the sheriff commanding him to summon a jury and decide upon the legality of the dispossession. This writ of novel disseisin was not abolished till 1833.

**MERV**, a district of Central Asia, near the N.E. frontier of Persia, embracing a fertile tract separated from the surrounding desert by the river Murghab, and known as the Oasis of Merv. This oasis is a highly cultivated and thickly populated district of about 600 square miles, with a computed number of nearly 500,000 inhabitants. Irrigation is effected by numerous canals and channels from the main course of the Murghab River, which is dammed at three places for the purpose of making the most of its volume within a limited space. The remains of old Merv, consisting of the ruins of Ginoor Kala, Sultan Sanjar, and Bairam Ali, lie at the most eastern point of this territory, on the recognized caravan route to Charjui and Bokhara; but the present town, which, strictly speaking, is now nothing more than the fort of the late chief of the Toktamish, or principal branch of the Teké Turcomans, is situated on the Murghab itself, some 30 miles south-west of the ancient cities. Round the fort is a straggling collection of *kibitkas* or mud huts, and the fort is locally known as Kouchid Khan Kala. The distance to the Indian frontier is 650 miles; to the Afghan frontier, about 150 miles; and across the breadth of Afghanistan, 500 miles. In a military sense, Merv has been considered a place of importance from the earliest times, as it is the junction of two strategic lines of advance on Herat, and it was fixed on as an important point by Napoleon in his projected invasion of India. It is also the meeting point of two great Asian trade routes.

Old Merv, after passing under the power of numerous Asian conquerors, was finally occupied by a Turkoman tribe in 1856, who, after a prolonged and gallant resistance to the Russian power, were overcome in 1881 by General Skobelev; and a deputation visited St Petersburg and made obeisance to the Czar, though in 1877 they had declared allegiance to Persia. In 1884 the Mervis completely submitted to Russia, and accepted the duty of paying taxes, and of furnishing a military contingent.

**MERVINGS or MEROVINGIANS**, the first great dynasty of Frank sovereigns of Gaul. See FRANCE.

**MESACONIC or CITRACARTIC ACID**, an acid obtained by oxidizing citraconic acid with nitric acid. It crystallizes in colourless needles, and is soluble in hot water, alcohol, and ether. It melts at 206° C. (392° Fabr.) The formula is  $C_6H_6O_4$ . It forms a number of crystalline salts called mesaconates and an ether ( $C_9H_9O_4$ ).

**MESEMBRYAN THEMUM**. See FIGOIDEÆ.

**MES'ENTERY** (literally, "amidst the bowels"), a term in anatomy applied to several duplicatures of the peritoneum which maintain the different portions of the intestinal canal in their respective situations, allowing, however, more or less motion. They are formed of two laminae, between which are contained the corresponding portion of intestine and the vessels that pass to it. One only of these duplicatures has received the name of *mesentery*, properly so called. This belongs to the small intestine, which it suspends and retains *in situ*. Its posterior margin, which is the smallest, is straight, and descends obliquely from the left side of the body of the second lum-

bar vertebra to the iliac fossa. Its anterior margin is curved, and corresponds to the whole length of the small intestine.

**MESH'ID** or **MASH'ED**, a fortified city of Persia, the capital of Khorasan, 201 miles N.W. of Herat. Population, 100,000. It has manufactures of velvets, jewelry, sword-blades, &c., and gunpowder, and an active trade with Bokhara, Kandahar, Herat, and Yzed. The town stands in the midst of a fertile plain, is inclosed by strong walls about 7 miles in circuit, and contains the magnificent mausoleum of the Imam Riza and the Caliph Haroun al Raschid; but its private buildings are mostly of sun-dried brick, and its colleges are in ruins. The mosque is one of the most magnificent in the world, and has two beautiful minarets. The shrine is visited by large numbers of pilgrims every year. The town is by far the most important in North-east Persia, being the centre of numerous converging routes. It is the chief city of the great sect of Shiites, and is thus of nearly equal importance with Mecca, the sacred city of orthodox Mohammedans. The town is not a pleasant place, owing to its foul water, and from the fact that (it being a holy city) unburied Persians are brought there in vast numbers for interment from the most distant parts of the empire and in the most horrible condition.

**MESITIC ALCOHOL**, see **ACKTONE** ( $C_3H_5O$ ), for which it is another name, the alcohol or hydrate of **MESITYL**.

**MESITIC ETHER** or **OXIDE OF MESITYL** ( $C_6H_{10}O$ ) is a colourless oil having an odour of peppermint. The specific gravity is 0.848; the boiling point,  $181^\circ C.$  ( $267^\circ$  Fahr.)

**MES'ITYL**, a hypothetical radicle, having the formula  $C_3H_5$ , and unknown in the isolated state. Chloride of mesityl can be obtained from acetone by the action of hydrochloric acid. It is a heavy, oily liquid, having the formula  $C_3H_5Cl$ .

**MESITYLENE** or **MESITYLOL** is a hydrocarbon obtained from acetone by the action of sulphuric acid. It is a light oil of garlic odour, burning with a bright smoky flame. The formula is  $C_6H_{12}$ ; boiling point,  $162^\circ C.$  ( $323^\circ$  Fahr.) The chlorine derivative is trichloromesitylene ( $C_6H_3Cl_3$ ); the bromine derivative is tribromomesitylene ( $C_6H_3Br_3$ )—both crystalline bodies. There are also two nitro-derivatives, and a base known as nitromesidine ( $C_6H_{12}N_2O_2$ ), which crystallizes in yellow needles, and combines with acids, forming a number of salts.

**MESMER, FRIEDRICH** (or **FRANZ**) **ANTON**, the founder of the theory of animal magnetism, sometimes called after his name Mesmerism, was born at Weil on the Lake of Constance, 23rd May, 1733. He studied medicine at Vienna, and after taking his degree commenced practice. He devoted himself at first to the study of astrology, and in 1766 published a work "De Planetarum Influ," in which he promulgated the theory that the planets exercised an influence over the human body. Soon after he commenced to attempt the cure of disease by stroking the body with magnets, and after a controversy with Father Hell, a Jesuit of Vienna, respecting the original discovery of this practice, he discarded the magnets and relied upon manipulation alone. His pretensions having involved him in much controversy he moved to Paris in 1778, and in a short time his claims became the general talk of that capital. By the medical faculty he was denounced as a quack, but he soon made many converts and gained considerable sums of money from patients who believed that he had cured them of different diseases. He is said to have received his patients in a dimly lighted hall hung with mirrors, and to have arranged them in a circle round a kind of vat of simmering chemicals, which he termed a *baquet*. Silence reigned, only interrupted by soft strains of distant music which floated at intervals through the room, and when the patients were supposed to have become sufficiently nervously excited Mesmer walked solemnly

and slowly round the circle, influencing some by a glance, touching others with a wand, and making passes over the faces or bodies of the rest. At length the government appointed a scientific commission to investigate the subject, and their report being very unfavourable Mesmer thought fit to resume his travels, and he removed from Paris to England. He afterwards fell into obscurity and died at Meersburg in Swabia, 5th March, 1815.

Although he mingled much quackery with his practice Mesmer genuinely believed in his own power to influence others, and there was in reality a basis of truth for his pretensions. Experiments made by some of his disciples showed that many of the phenomena might be produced merely by gentle manipulations, and without the aid of any of the appeals to the imagination used by Mesmer himself. Under the titles of *oddylic force*, *animal magnetism*, *electro-biology*, and *mesmerism*, the subject for a long time remained on the border-land of charlatanism; but more recently it has been made the subject of scientific inquiry, and most of its phenomena have received adequate physiological explanation. [See **HYPNOTISM**.] See also Dr. W. B. Carpenter's "Mental Physiology" (London, 1874), Maudsley's "Physiology of Mind" (London, 1876), and Heidenhain's treatise on "Animal Magnetism" (Eng. trans., London, 1880).

**MESNE**, in law, a term denoting *intermediate* or *intervening*. Thus *mesne process* is generally used in contradistinction to *final process*, and signifies a writ or process issued between the commencement of an action and the suing out of final process, or execution.

**MES'OBLAST**, the medial layer of the blastoderm of the embryo of vertebrates, from which in due course are derived all the tissues and organs of the body between the skin and the epithelium of the digestive tract—that is, all the muscles, nerves, genito-urinary system, and connective tissue, and the digestive canal, except its epithelial lining.

**MES'OLITE** (Gr. *mesos*, middle, and *lithos*, a stone) is one of the triclinic zeolites. It is allied to natrolite, but the base, soda, is partly replaced by lime; it is therefore a hydrous silicate of alumina, lime, and soda. Mesolite occurs mostly as fine white acicular crystals, lining the drusy cavities of such rocks as the tertiary basalts of Scotland and North-east Ireland.

**MESOLON'GHI** or **MISSOLON'GHI**, perhaps the ancient *Olenus*, in Livadia, a small town in Greece, lies on the northern side of the Gulf of Patras, near its entrance, and right opposite Cape Kolorgia, or Papas, in the Morea, 22 miles west of Lepanto. It became remarkable during the Greek insurrection of 1826 against the Turks, through its siege and capture by Ibrahim Pasha, the commander-in-chief of the besiegers. The heroic resistance of the Greek garrison, and their ultimate fate, made the name of Mesolonghi popular over all Europe. Lord Byron died here in 1824.

**MESOPOTA'MIA** is a Greek word which means "a tract between rivers." It corresponds to the Old Testament *Aram-naharaim*, that is, "Aram," or "Syria between the two rivers," and the term was applied to the whole or at least the more fertile portion of the district now known as Al-Jesirah or the island, to the north of the Median Wall, between the Tigris and the Euphrates after they leave the mountains. The country stretching southwards along the channels of these rivers to the Persian Gulf, and corresponding to the ancient *Babylonia*, is properly termed *Irak Arabi*, but in modern times the word *Mesopotamia* is often used for both districts, covering an area of about 180,000 square miles. This country so defined forms one great geographical region, hilly and undulating where it borders on Armenia, clothed with forests of oak, maple, chestnut, and terebinth, but for the most part consisting of a series of levels, the renowned plains of Assyria and Babylonia. The character of these plains varies from alluvial deposits

on the banks of the rivers periodically overflowed, to permanent marshes, sandy or stony tracts often impregnated with salt and bitumen—true deserts, inhabited by the roving Arab, wild ass, and ostrich. The greater part of the territory is now included in the pashalics of Urfa (ancient *Orphak*) and Bagdad. Throughout the whole district the summer heat is excessive, but in the northern part, during the autumnal and spring months, the strongly-contrasted temperature of day and night is the chief peculiarity of the climate. The northern part of the ancient Mesopotamia was divided into two parts by the river Aborras or Chaboras (*Khabour*), called *Arazes* by Xenophon, which rises in Mount Masius, and receiving the Mygdonius (*al Hual*) on the east, flows into the Euphrates at Ciresium. Of these divisions the western was called Osroene, and the eastern Mygdonia.

The chief town of Mygdonia was Nisibis, also called Antiochia Mygdonica (*Nisibin*), situated on the river Mygdonius, in a fertile plain at the foot of Mount Masius.

The chief town of Osroene was Edessa (*Orfa*), in the north-west of the province, 9 geographical miles from the Euphrates. Two days' journey, according to Niebuhr, south-east of Orfa, was the ancient town of Charræ (*Harran*), the Haran of the Scriptures, where Abraham's family dwelt after they had left Ur of the Chaldees. Charræ is memorable in Roman history for the defeat of Crassus.

Ciresium (*Kerkesiah*), at the union of the Euphrates and Aborras, was a very ancient town: it is often wrongly identified with the Carchemish of the Old Testament. A little to the north of Ciresium, near Thápsacus, was an ancient ford across the Euphrates.

**MESOXALIC ACID**, an acid obtained from allozan by the action of alkalis. The formula is  $C_3H_2O_5$ . It is a crystalline body, soluble in water, and yielding a number of crystalline salts.

**MESOZOIC ERA** is one of the great subdivisions of geological time; it occupies a medial position, intervening between the *Palæozoic* and *Cainozoic*, and it contains a fauna and a flora intermediate in character and development between those of the earlier and later divisions of geological time. From this it derives its name (Gr. *mesos*, middle, *zoe*, life), as distinguished from the "ancient" and "recent" types of organization.

The most striking feature of Mesozoic life is the vast development, in size, number, and diversity of organization, of the reptilian class of animals. The precursors of these beasts appeared during the later epochs of the *Palæozoic*. Comparatively few diminutive forms still remain, but during the Mesozoic era they were the dominant type, though not the most highly organized. Their characters appear to have pervaded the other classes of vertebrates, whether birds or mammals. Among invertebrate life the cephalopods culminated; some genera, as the ammonites and belemnites, being wholly confined to strata of this age. In its flora the Mesozoic was essentially an age of gymnosperms, cycads being specially abundant.

On the British Isles rocks of Mesozoic age cover a great portion of the midland, east, and southern counties of England; outlying patches occur in Scotland and in North-east Ireland, where they have been preserved under volcanic products of Tertiary age. These are probably but fragments of strata that had a much wider distribution. During Mesozoic times, in the British area the volcanic forces appear to have been almost altogether dormant, though in North Cornwall and Devon certain igneous rocks are considered to be of this age; but in other parts of the globe volcanicity was particularly rife.

Although as regards the thickness of the strata and duration of this era in geological time, as well as in diversity of dominant types, the Mesozoic is inferior to the

Palæozoic era, yet it is of more especial interest, owing to the abundance of fossil forms which it contains, and to the regular development it has in England. It was from the strata of this age that William Smith, the father of English geology, worked out those fundamental principles from which the present science of geology has arisen.

The Mesozoic has in general a tripartite subdivision as follows:—Cretaceous Period, Jurassic Period, and Triassic Period. Although, generally, these periods are well marked and widely separated from each other both stratigraphically and palæontologically, yet in many instances there are local deposits of minor extent that fill up the breaks and render the Mesozoic formations, as a whole, fairly continuous. The Palæozoic era, in its most typical development, ends with the Carboniferous period. The Permian beds form a sort of transition series to the Mesozoic; its fossils are somewhat intermediate in character, but they have affinities which link them inseparably to Palæozoic life. The Permian rocks are therefore included among the Palæozoic strata.

*The Triassic Period* is the earliest subdivision of Mesozoic time. The strata which represent it rest unconformably on the Permian and older rocks; they contain few traces of fossil remains, and consist largely of conglomerates, sandstones, and marl, that are mostly coloured red by oxide of iron. Saliferous beds are largely developed in this formation. The Trias rocks consist of three members—the *Bunter* below, the *Muschelkalk*, which is absent in Britain, and the *Keuper* above. The Rhætic beds rest on the Keuper quite conformably, and at Penarth, near Cardiff, the physical gradation is perfect. The white Lias of Lyme Regis, which is of the same age as these beds, passes upward into the lower Lias; the same conformation is seen in other sections where the base of the Lias is exposed. The Rhætic thus connects the Triassic and Jurassic formations.

*The Jurassic Period* is the medial subdivision of Mesozoic time. The strata by which it is represented consist of a vast series of alternating limestones and clays, the latter usually more or less calcareous; minor sandy beds occur in some places, as also thin coal seams and other land formations. The Jurassic formation consists of two members—the *Lias* below and the *Oolite* above; it is very rich in fossil remains, and covers a large tract of the Midland counties of England. The regular occurrence of the beds of this formation, each with its peculiar fossils, suggested to William Smith his early notions of systematic geology. In the Isle of Purbeck the uppermost beds of the Oolite, the Portland limestones, are succeeded by the *Purbeck beds*. The stratigraphical relation of the two is so continuous that for a long time the Purbeck beds were grouped with the Oolite. They are chiefly composed of fresh-water strata with some old land surfaces, and the affinities of their fossils are with those of the succeeding formation; these facts have led to the Purbeck beds being grouped with the Wealden, as the *Wealden-Purbeck* formation, lying at the base of the Cretaceous, and equivalent in part to the marine strata or Neocomian of the Continent and North Britain. The Purbeck beds therefore help to link the Jurassic and Cretaceous formations together.

*The Cretaceous Period* is the uppermost subdivision of the Mesozoic; its strata consist of two subdivisions, of which the lower or Neocomian is represented in England by two distinct types. In North Britain the Speeton clay represents the marine type, and is equivalent to the vast thickness of Neocomian strata exposed in the Alps. In the south of England the Wealden formation represents the estuarine type, and is equivalent to the lower divisions of the Neocomian; it passes upwards into the lower Greensand (upper Neocomian), which is marine. *The upper Cretaceous* or *Chalk* consists of a stiff blue clay below—the gault—followed by the upper Greensand, which is in turn

succeeded by the Chalk, all of marine origin; but in point of thickness of strata and duration in geological time, the last member vastly predominates over the other two. The Cretaceous marks an era of continental depression; its upper beds overlap successively the lower members and older formations, and resting in some instances even on Palaeozoic rocks.

This closes the Mesozoic, but in some localities on the Continent, as at Maestricht, beds occur containing an admixture of Cretaceous and Tertiary fossil forms, and evidently of intermediate age. In America the Cretaceous appear to pass into the Tertiary. They there contain vast lignitic deposits.

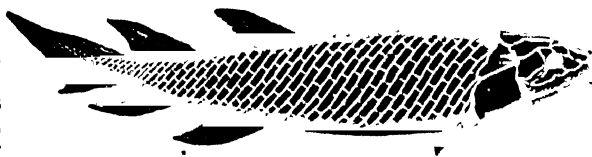
During Mesozoic times the earth was inhabited by animals intermediate in character between the less complex, though varied, organisms of Palaeozoic time, and the highly differentiated types of animals found in the Cainozoic. Throughout recorded geological time the simpler types of life have remained fairly constant, but each great era has had some more highly organized form peculiar to it. This has resulted from the differentiation of some branch in a special direction, which, after flourishing for a time in great numbers of considerable variety, has either died out suddenly or materially decreased in abundance. During the Mesozoic era the culminating branches were: among the invertebrates, the Cephalopoda, and among the vertebrates, the Reptilia. The latter predominating not only in variety and numbers, but also in size, they were probably the most formidable beasts then existing, and their special forms ruled on the land, in the sea, and in the air. Of these great branches of animal life the ammonites, belemnites, and the great saurians were peculiar to the Mesozoic. Among plant life the gymnosperms predominated, the cycads being especially abundant. Both fauna and flora of Mesozoic time speak of a climate at once warm and uniform.

Throughout the Mesozoic formations the gradual development of plants and animals is well marked. In the Trias the ferns, which had their representatives in the Palaeozoic, still continued, but the Sigillaria, Lepidodendra, and Calamites had all disappeared, their place being taken by conifers and cycads, the latter reaching their greatest development during the Jurassic period. In the Cretaceous rocks angiosperms—both palms and dicotyledons—make their appearance, and the genera of many living forest trees are represented.

Among invertebrate life the echinoderms are represented by both the *stemmed* and *free* subdivisions. In the Trias the Palaeozoic forms, Cystidea and Blastidea, had disappeared, but the erinoids or lily encrinites, with plumose arms, still lived on, and were abundant. In the Jurassic these still continued, but the free forms—Echinoides and Asteroidea—were about equally abundant. In the Cretaceous the free forms predominated, the echinoids or sea-urchins (see Plate) especially so. Of the Mollusca, the brachiopods predominated in the earlier formations, but in Cretaceous times the lamellibranchs were in the ascendant. The brachiopods were almost all of the sloping-shoulder type, represented by such genera as Terebratula and Rhynchonella; the square-shouldered forms, Productus, Strophomena, and Spirifer having almost all disappeared, though some few forms lingered on as high as the Lias. In the Jurassic the lamellibranchs became extremely abundant; the first of the oyster family occurred here, as Ostrea, Gryphaea, and Xyogyra (see Plate); Trigonia and Miceras were also remarkable. In the Cretaceous rocks these genera continued, with the addition of the Avicula family—Inoceramus, &c. (see Plate)—and the strange shells Rudistes and Hippuritidae, peculiar to this formation. Terebratulae also formed a conspicuous feature. In these rocks also the beaked or siphonated gasteropods become abundant. The cephalopods are remarkable throughout

the whole Mesozoic. The Palaeozoic forms—orthoceratites and goniatites (excepting a few in Alpine Trias)—had disappeared, being replaced by ceratites, which are confined to the Trias, and the ammonites (see Plate), which made their appearance here and continued in prodigious numbers throughout the Jurassic and Cretaceous periods, among them being found some of the largest known cephalopods (excepting some Silurian orthoceras). About 500 species are known, varying from half an inch to 8 feet in diameter. They culminated in the Jurassic, and are wholly confined to Mesozoic rocks. Before dying out altogether, several aberrant forms of this family appeared in the upper Cretaceous, as Scaphites (see Plate), Criocerat, Toxoceras, Anchyloceras, and Hamites, all partially uncoiled; Turritulites and Helioceras, coiled spirally like gasteropods, and Baculites, completely uncoiled. The Ammonitidae belong to the shelled or tetrabranchiate tribe of Cephalopoda; the Belemnites, on the other hand, belong to the dibranchiate or naked tribe, which has the most numerous representatives in our modern seas, and of which the squid or cuttle-fish is the most familiar representative. The Belemnites appeared in the Jurassic, and attained a numerous development and great size. The portion preserved (see Plate Mesozoic Fossils) corresponds to the phragmocone of the cuttle-fish, that found of one species, *Belemnites giganteus*, being 2 feet long and 8 or 4 inches in diameter. These beasts continued through the Cretaceous, but disappeared at its close. The Crustacea are not so prominent in the Mesozoic as they were in the Palaeozoic; the Trilobites and Euripterids had disappeared. The Macrourans, which appeared in the Carboniferous, lived on through the Trias and Jurassic with some limuloids, but, by a shortening of the tail and change in other characters, they approached the Brachyurans or true crabs. The earliest crab—a spider crab, *Palaenichnus*—has been found in the Jurassic. Several genera of Brachyurans are also found in the Cretaceous.

Among vertebrate animals the several classes of fishes are represented. Ganoids and placoids, which appeared in the later Palaeozoic, continued throughout the Mesozoic, and have their representatives in modern seas. In the Palaeozoic and earlier Mesozoic the placoids had either crushing teeth—cestracions—or pointed teeth, with rounded



A Ganoid Fish, showing heterocercal tail and covering of bony plates.

corners—hybodonts. These latter, which came in with the newer Palaeozoic, culminated in Jurassic times and passed out with the Cretaceous. The cestracions, though not very numerous, survived the Mesozoic, while the modern sharks, with lancet-shaped teeth—the squalodonts—appeared in the Jurassic and became very abundant in the Cretaceous. Though teleosteans, or the modern bony fishes, did not appear till the Cretaceous, they are partly foreshadowed in the Jurassic by the ganoids, which assume more the modern form with homocercal tails. The teleosteans in the Chalk are large and numerous. Several are related to the modern salmon, herring, perch, and pike, while Beryx of the Chalk still lives in the open sea.

The reptiles form the most conspicuous feature of the Mesozoic fauna. In the Palaeozoic the highest vertebrates were mostly labyrinthodonts, but some true reptiles have been found. In the Trias the labyrinthodonts reached their climax and then became extinct, the beaked saurians,

Rhynchosaurus, also died out; they are peculiar to the Trias. The eualiosaurians, or those huge marine reptiles of which the Ichthyosaurus may be taken as a type, lived in the Trias, culminated in the Jurassic, and continued on through the Cretaceous. The earliest dinosaurs also have been found in the Trias; they had affinities with both mammals and birds, especially in their limb-bones and pelvic girdle; they could stand erect and walk on their hind legs. Probably many of the three-toed footprints of bipeds in the Connecticut valley were produced by these beasts, though possibly some of them belong to birds; the Iguanodon of the Weald, the Megalosaurus of the Jurassic, and the Atlantosaurus found in America, are among the most remarkable. The pterosaurs were huge flying reptiles; they appeared in the Jurassic, and continued on through the Cretaceous. The wing was formed of a membrane attached to the fifth digit, and the bones and sternum were bird-like. The earliest crocodiles occurred in the Trias; they attained a great size during the Jurassic, but during the Cretaceous they appear to have exceeded in length any known beast. The earliest turtles appeared in the Jurassic, and during the Cretaceous period they attained an enormous size.

Remains of birds are found in the Jurassic, the earliest in the Solenhofen slate of Germany, which is of Oolitic age. This early form, the *Archæopteryx*, had many reptilian characters. It had a long lizard-like tail, each vertebra feathered, teeth in jaws, and four separate digits on the fore limbs. In the Cretaceous of New Jersey a remarkable set of birds have been found; they had long slender jaws, with teeth set in sockets, and vertebrae like fishes, biconcave; other forms had teeth set in grooves, but ordinary bird-like vertebrae; some forms have also been found not unlike the existing type of bird.

Mammals make their first appearance in the Trias; the remains of two or three insectivorous marsupials have been found; again, on two horizons of the Jurassic the remains of about twenty species have been discovered, all marsupial and insectivorous except one, which was probably a rodent. These animals were semi-oviparous, and therefore allied to birds and reptiles, which are oviparous; the true placental mammal is not found except in the Cainozoic.

**MESSALINA** was the name of any lady of the gens or clan Messala. The best known Messalina is the infamous wife of the Emperor Claudius. She was the third consort of that prince, and was already his wife before his accession. Her father was Marcus Valerius Messala Barbatus. Her profligacy was phenomenal, and was known to every one except the good-natured pedant who occupied the throne. She was as cruel as she was licentious, and no man's honour or life was safe from her attacks. While she refrained from molesting the court party her unbounded power over the emperor's affections protected her, but when the equally vicious Narcissus, the emperor's favourite freedman (a son of a slave), found that Messalina was intriguing against him, he quickly headed a conspiracy which was formed to put an end to her life. Messalina in one of her mad caprices had publicly married a Roman youth while the emperor was away, and upon this merely wanton piece of crime Narcissus erected a tale of a great plot to degrade the emperor in the eyes of the people preparatory to dethroning and murdering him. Claudius believed, but even then felt unable to act upon his belief. He offered no opposition, however, to Narcissus sending out a death-warrant, and Messalina was strangled in the gardens of Lucullus, on the Pincian Hill, A.D. 48.

**MESSIAH** (Heb. *Mashiach*, anointed) is a term used in the Old Testament, in the first sense, to designate any one anointed with the holy oil, and it is applied to the high priest, to the kings of Israel, and even in Isaiah xlv. 1, to Cyrus, a foreigner and a heathen. Later it came to be applied to an expected deliverer and saviour who should be

emphatically "the anointed" of Jehovah. We cannot find any clear evidence of the existence of the Messianic hope among the Jews earlier than about the eighth century B.C., when through the influence of the prophets the conception of a spiritual kingdom of Jehovah began to take the place of the older notion which regarded him as being the national deity of the sons of Israel. The idea as it first appears is indefinite, and does not necessarily centre round any particular person, though it includes the vision of a purified and renewed kingdom, dwelling in peace and prosperity under the rule of Jehovah. After a time the idea became connected with the expected rise of a prince of the house of David who should be full of the spirit of Jehovah, and who should be the deliverer and ruler of his people. Most of the prophets directly connect the final restoration with the removal of the sins of their own age, and the advent of the deliverer is regarded as an event near at hand. At the time of the captivity the idea of the deliverance relapses to its original general form, and though Jeremiah and Ezekiel refer to the future prince of the house of David, they connect the salvation of Israel rather with the direct interposition of Jehovah than with the coming and work of a kingly deliverer. After the restoration of the Jew to Palestine, the troubles by which they were continually beset, and the contrast between their condition and the glowing promises of the prophets, caused them to look forward with renewed earnestness for the realization of the hope of the nation, and the conception of the promised deliverer expanded until a supernatural element was added, as we see in the Book of Daniel. In the Book of Enoch, which was written in the century before Christ, and which is quoted in the epistle of St. Jude, we find a very full development of this idea, and the Messiah is represented as being concealed with Jehovah from before the creation of the world, as being the appointed ruler and judge of the earth, and the representative of God to man. At the time of Christ the hope of the speedy coming of the Messiah had pervaded all classes of the Jewish nation, and in the books of the New Testament we may see how the old notion of a Davidic king who should restore the kingdom to Israel, that of an inspired prophet and leader like unto Moses, and that of a supernatural being who should come attended by signs and wonders, existed side by side, or were blended together in the expectations of the people. It is a matter of controversy whether the conception of a suffering Messiah had arisen among the Jews at that period, but the more probable opinion is that it had not. Just as certain elements in the teaching of the New Testament have always been quietly ignored or "figuratively explained" by Christians, the words of the prophets speaking of the sufferings of the Messiah, as in Isaiah liii., &c., seem to have been left out in the conception of the Messiah. At a later period, when the long polemic with Christianity had arisen, and these passages were claimed by Christians as having been fulfilled in Christ, the notion that two Messiahs, one a suffering son of Jacob or Ephraim who should die for Israel, and one a conquering, ruling son of David, were referred to by the prophets, found a place in the Rabbinic theology. From Josephus we learn that the expectation of the immediate coming of the Messiah had much to do with the rebellion against Rome which led to the destruction of the Jewish state, and at a later period the celebrated Bar-Cochebas was recognized by Rabbi Ahiba as the promised deliverer. Even the complete destruction of Jerusalem was insufficient to quench the hope of the Jews, and we find that at several different times in their history men have risen claiming the Messiahship, who have gathered round them a number of followers whom they have led to ruin and disaster. Even yet the expectation of a supernatural Messiah forms part of the religion of orthodox Jews everywhere.



The Christian doctrine concerning the Messiah differs most essentially from that of the Jews. By his disciples Jesus was recognized as "the Christ," the Greek equivalent of the Hebrew term "Messiah," and we see that Jesus endorsed this recognition, and accepted and applied the Messianic prophecies to himself. But we see also that, in direct opposition to the current theories concerning the Messiahship and the ideas of his disciples, Jesus held up the ideal of a purely spiritual and universal kingdom in which he was to reign and rule over the hearts of men. In the early days of the Christian church the chief distinguishing mark between the Jews who believed and the majority of their countrymen, was that the former accepted Jesus as the Messiah and the latter rejected him. The observance of the Jewish ordinances and the use of the temple service, &c., was maintained by the followers of Christ as well as by the rest of their countrymen, and both appealed to the books of the Old Testament, limiting the controversy to the members of the Jewish nation only. In the book of the Acts of the Apostles, and in the epistles of St. Paul, we are able to trace the growth and development of the doctrine of the church on this subject, and we have also a glimpse at the controversies which arose between those who clung tenaciously to the old Judaic conceptions and those who accepted the higher and more catholic teaching of the apostle of the Gentiles. Christian theologians, taking for their standpoint that in Jesus Christ we have the Redeemer and Saviour of the whole human race, find references to the Messiah throughout the whole of the Old Testament. In the promise given to Eve the first hint of the coming deliverer is found, and in the promises given to the patriarchs, in the Mosaic law and ritual, in the words of the psalmists and prophets, mystical "foreshadowings" of his coming, ministry, sacrificial death, resurrection, and final triumph, are regarded as being amply set forth. An elaborate examination of all such passages from the Christian point of view will be found in Dr. Pye Smith's "Scripture Testimony to the Messiah."

**MESSINA** (the ancient *Zanklé*, a sickle, so called from the shape of its harbour, and *Messana*), the chief trading town and port of Sicily, lies on the north-east coast of the island, on the strait of the same name, 120 miles north-east of Palermo, with which it is connected by railway. The town is built partly on a declivity and partly on the shore, and presents a magnificent appearance from the sea. The larger part of it rises in the form of a crescent on the west side of the harbour, along which there is a fine quay lined by a handsome row of buildings. The public buildings are—the cathedral, the churches of La Candelara and the Capuchins, which contain some fine pictures; the Greek church of Santa Maria; the royal palace; the archiepiscopal palace; the arsenal, the bank, public library, hospitals, theatres, a town-hall, exchange, lyceum, and a custom-house, with a lazaretto on the east side of the harbour. The town has several broad quays, and generally wide streets. The principal and many of the secondary streets have been planted with trees. The port is defended by a citadel and six forts. Messina gives title to an archbishop; it has a provincial court of appeal, a commercial tribunal, a royal college, and had 126,497 inhabitants in 1881. Some manufactures of damasks and satins are carried on. There are also many tanneries and iron foundries. The port is formed by a strip of sandy beach projecting into the sea south of the town, and sweeping into a semicircle. The harbour, which is about 4 miles in circumference, is one of the best in the Mediterranean. It has deep water throughout, and large vessels can load and unload close to the quays. The chief exports are oranges and lemons, raisins, currants, silk, wine and spirits, olive oil, linseed, salt fish, &c.; the imports consist of colonial produce, cotton and woollen goods, hard-

wares, and other manufactured articles. There is steam communication with Naples, Marseilles, Malta, London, Liverpool, and Glasgow; and active tunny and other fisheries are carried on. The coasting trade is chiefly carried on by Italian steamers, which touch at several places on the coast of Italy and Sicily. A dry dock, between the Lazaret and Fort St. Salvatore, capable of containing vessels of the largest burden, has been completed. Great damage was done to the city in 1848, when it was taken by the Neapolitan troops, after a bombardment of five days, on the 7th of September. Messina surrendered to the Sardinians on the 13th March, 1861, and thus became annexed to Italy.

**MESSINA, THE STRAIT OF**, separates Italy from Sicily, and unites the Tyrrhenian and Ionian portions of the Mediterranean. The length is 21 miles, and breadth at the northern entrance  $2\frac{1}{2}$  miles; at the southern,  $10\frac{1}{2}$  miles. The shores are steep, and the water is deep close to the land. There is a current up and down the middle of the strait, alternately every six hours, with a velocity of from 2 to 5 miles, apparently due to a slight tide; this occasions a counter set on each shore, often forming eddies with the central strain, and whirlpools in very fresh breezes. The descending or south-east current makes the water roughest. Often when a ship is moving very slowly the current turns her round, and causes alarm to the inexperienced. The rock of Scylla is on the Italian side, north of the narrowest part, which is opposite the Faro point. There are caves under the village of Scylla into which the sea rushes in rough weather with a noise like the barking of dogs, which probably gave rise to the fabled horrors of the rock. Outside the tongue of land forming the harbour of Messina is the Galafaro or vortex of Charybdis. It is rather an incessant undulation or reciprocation of eddies and waves than a vortex; it rarely assumes a vortical appearance, yet has such force that large vessels have been whirled round by it. It has a depth of 70 to 90 fathoms. Into this species of whirlpool the diver Cola Pesce of Catania precipitated himself during the reign of Frederick II., an incident on which Schiller founded one of his ballads.

It is only in straits like this, or the lagoons of Venice, and the heads of bays, as the Syrtis and Bay of Naples, that a tide is sensible in the Mediterranean. In the Strait of Messina the rise is only a few inches, and is often undistinguishable.

**MES'TA**, a Spanish word which commonly means a mixture of two or more kinds of corn, but is applied in a particular sense to the union of the sheep of several proprietors in one collective body. Of the custom denoted by this particular application of the term, the present article treats. The vast tracts thrown out of cultivation and left unoccupied after the expulsion of the Moors from Estremadura in the thirteenth century, were soon clothed by nature with rich pasture, which attracted the attention of the upland shepherds of Leon and Castile, who drove their flocks thither to milder winter quarters. The great plague of 1348, which swept away two-thirds of the population of Spain, left many more unclaimed and uninhabited lands in most of the provinces of Spain, and on these also the restless flocks soon encroached. On this custom of migratory pasturage, originating in usurpation, in circumstantial necessity, or in both, the proprietors of the flocks, who have always included the great nobles, conventual and other ecclesiastical corporations, and persons in power, founded a claim, which long possession converted into a prescriptive right, so that the mesta has long been an institution of Spain, regulated by a special code, and guarded by its own judges and courts of law. The number of these migratory sheep at the present time probably exceeds 5,500,000. In the month of April the flocks leave the plains of Andalusia and Estremadura for the cooler pastures of Leon, the



two Castiles, and Aragon, whence they begin to return southwards in October. For the lands depastured during the winter months a low price is paid, regulated by usage, and on which no advance is allowed. The sheep are divided into flocks of 10,000, each managed by a conductor, who has under him fifty shepherds and as many dogs. They pass unmolested, and feed over the pastures and commons that lie on their road; they are not allowed to traverse cultivated lands, but the proprietors of such lands are obliged to leave a clear space, 85 yards wide on each side of the road, for the passage of the flocks. At night they are penned in with nettings made of the esparto rush. The different routes and the length of each day's journey in these migrations are fixed by immemorial usage. Lambing takes place during the winter sojourn in the south. The sheep-shearing commences in May on the northward journey, and is effected in vast buildings by the road-side, called *esquileo*, capable of containing 50,000, and some of them 60,000 sheep; the principal of these buildings are in the environs of Segovia.

The Spanish sheep are descended from a cross between the famous Baetican breed and a flock of English sent over with John of Gaunt's daughter, Catharine, on her marriage with the heir of Enrique III., king of Castile. These are said to have been called *marinos* from having come over the sea, and hence by corruption came the name *merinos*. The wool of the sheep belonging to the mesta is celebrated for its fineness, length of fibre, and silky softness; this excellence is said to be owing to the habits of the sheep, whereby they are led to live in almost always the same temperature. The carcase of the mesta sheep is bad; indeed they are prized only for the fleece; after five years they are useless, having then lost their teeth. The sheep know of themselves when to go northwards, and when to return to the south; and if not led on will set out of their own accord. They are always on the move (except when penned for the night), and from this circumstance they are distinguished from the stationary sheep of Spain by the name of *trashumantes*, or wanderers.

**META**, the ancient Roman goal or turning-point in the circus, marked by three conical pillars set in a group at the end of the wall, called the *epina*, which longitudinally divided the arena, extending nearly from end to end, with a space at each extremity for the racers to turn in.

**METABOLISM**, a very convenient term in physiology, introduced by Schwann in 1839. It refers to the chemical changes due to the action of living tissues, which create room for new protoplasm or vital substance by the breaking up of old protoplasm and its ejection from the body in secretions or excretions of various forms. The specially metabolic tissues other than the secreting and excreting organs are the fat cells, hepatic cells, lymphatic glands, ductless glands, &c.

**METACENTRE** is the name given to an imaginary point in a floating body, the position of which determines the stability of its equilibrium. The body is at rest when the centre of gravity of the body is in a vertical line with the "centre of buoyancy." This lies at what would be the centre of gravity of the body of water which would occupy the space now filled by the floating body if the latter were removed. This vertical line is the axis of flotation.

If now the floating body be tilted, then the axis is inclined to the vertical. But the new centre of buoyancy is not the same as the former. Let a vertical be drawn through the new centre of buoyancy, which will of course cut the axis in its inclined position; the point of section is called the *metacentre*.

When the metacentre falls above the centre of gravity of the floating body, the equilibrium is stable, and the body will recover itself after tilting; but when the metacentre falls below the centre of gravity, the equilibrium is unstable, and the body will roll over.

**META'GETONE**, an oily body obtained in the destructive distillation of wood. It is a colourless oil, insoluble in water, but soluble in alcohol and ether. The formula is  $C_6H_{10}O$ ; the boiling point,  $84^\circ C.$  ( $183^\circ$  Fahr.) It is isomeric with oxide of mesityl.

**METAGALLIC ACID**. See GALLIC ACID.

**METALLURGY** is the art of extracting metals from their ores and applying them to various uses. It is an art that has been known and practised from a very remote period, for two of the divisions of prehistoric time are called by geologists the bronze and iron ages, being the epochs during which early man had respectively bronze and iron weapons. It is worthy of remark that the use of bronze preceded that of iron, and that this ancient alloy was composed of about 10 per cent. of tin and 90 per cent. of copper; both metals requiring a considerable amount of metallurgical knowledge for their extraction. One of the first historical mentions of the art is that of Tubal-Cain (Gen. iv. 22); and, later on, silver, gold, and other metals are frequently mentioned. It is not surprising that the metals which occur native, such as gold, should have attracted man's attention at a very early epoch. In "The Annals of the Four Masters," the record still remains of the first worker of gold in Ireland, one Tighearnmas, A.M. 2816 (Keating), and the locality is mentioned whence he dug the metal. From beneath 6 feet of peat, and the remains of an ancient forest in the south of the same country, have been exhumed the crucibles and other tools of an early race of goldsmiths of probably much greater antiquity. Crude methods for the extraction of copper and iron from their ores are frequently described by modern travellers as still practised by savage tribes. The Japanese, who are recognized as expert metallurgists, appear to have had the art from India at the time of the introduction of Buddhism.

In nature only a few metals—the noble metals chiefly—are found native, such as gold, platinum, palladium, indium, and osmium; some others, as copper, silver, mercury, &c., also occur. More usually the metals are chemically combined with a non-metallic substance forming a definite mineral species. This in mass constitutes the *ore*; it is usually associated with a large quantity of comparatively worthless non-metalliferous mineral or *GANGUE*; the deposit of ore and gangue may occur in a *LOBE*, bed, or other form of deposit. It is recognized by various names, as, ore deposit, metalliferous deposit, or mineral deposit. Probably the most commonly occurring ores are the sulphides; many other forms also are found. Some are secondary products derived from these, as sulphates and some carbonates and oxides, and others are in their original condition. The ore as it occurs in the mine is usually an aggregate of one or more mineral species, which may or may not contain more than one base. The ore when extracted from the mine requires in most instances a preliminary concentration or "dressing" to separate it from the gangue, and sometimes to separate different ores. This ore dressing consists generally of a picking or sorting, which is followed by washing, for which a great variety of machines are in use. The concentrated ore is then handed over to the metallurgist for him to extract the metal.

Metals are elementary substances that, under ordinary conditions, are solid (mercury is solid in high latitudes), and capable of receiving a peculiar lustre; at certain temperatures they possess an amount of plasticity and ductility, so that they can be moulded into various forms. Chemically united with some other substances they form a series of bodies known as salts, and, except in the case of arsenic and antimony, they do not form typical compounds with hydrogen. When two or more metals are mixed or caused to unite together they form an *alloy*; the union takes place without the evolution of heat, and the compound is possessed of metallic characteristics. Mercury united with other metals forms an amalgam. The union of metals

and non-metals is accompanied by the evolution of heat, and the compound possesses qualities differing from its components.

Although of the sixty-seven recognized chemical elements fifty-two are metals, only about twenty-two are of sufficient industrial importance to require much consideration from the metallurgist. Of these the following ten are used chiefly in the free metallic state—gold, silver, mercury, copper, iron, tin, lead, zinc, platinum, and aluminium. The first seven at least were known to the ancients, and were associated with the sun, moon, and five planets. Manganese, nickel, antimony, arsenic, and bismuth are chiefly used in alloys; while potassium, calcium, cobalt, and chromium, though their compounds are much used, are seldom required in the metallic state. Of the other metals sodium is required for the reduction of aluminium and magnesium, as well as for amalgamating with mercury for the reduction of certain auriferous ores; while some compounds of rarer substances are used to a small extent for various special technical purposes. Some of the physical properties of metals deserve a short notice.

The colour of the majority of metals is light gray or white, modified by various tints, but it varies according to the state of division. Copper is a red metal, and gold has a deep yellow-red colour. As lustre interferes with and modifies the colour, the true colour is best appreciated after repeated reflection of the light from two surfaces of the metal, so as to get rid of the white light. The colour is well seen on looking into a deep vessel composed of the metal, or between two parallel plates of the same. Metals are opaque, but gold in thin leaf transmits a deep greenish colour, and thin films of precipitated gold transmit a deep red carmine or purple light according to the method of precipitation.

The lustre of metals is produced by the reflection of light from their polished surfaces.

In hardness metals have a wide range, from titanium and manganese, which are harder than steel and scratch glass, to tin and lead, which can be scratched by calcite. Individual metals differ greatly in hardness, according to the method adopted in their preparation and subsequent treatment; thus steel can be hardened so as to scratch glass.

The crystallization of most metals is cubical; arsenic and antimony crystallize in the rhombic system.

Malleability is the property metals have of expanding in all directions, without rupture, under pressure or by hammering. Gold is the most malleable of metals; one grain can be beaten out to a thickness of  $\frac{1}{1000}$  of an inch, and will cover 75 square inches of surface; a grain of silver may be beaten to a thickness of  $\frac{1}{2000}$  of an inch, and a grain of iron to  $\frac{1}{3000}$ .

Ductility is the property of elongating without rupture, or of being drawn out into fine wire; it varies with the purity. Gold is the most ductile metal; one grain may be drawn to a wire 550 feet long and  $\frac{1}{1000}$  of an inch thick. Platinum has been drawn to a wire  $\frac{1}{1000}$  of an inch thick by first inclosing a fine wire in silver and drawing the compound thus formed.

Elasticity is the property of metals whereby after elongation they return to their original form.

Tenacity is the power of resisting rupture under an elongating strain. Taking the tenacity of lead as 1, gold equals 12 and steel 42.

Fusibility is the property of becoming liquid. It varies between wide limits in the metals—from mercury, which fuses at  $-39.44^{\circ}\text{C}$ ., to platinum, which fuses at about  $2000^{\circ}\text{C}$ . The rare metal gallium fuses at  $80^{\circ}\text{C}$ ., and iron at about  $1500^{\circ}\text{C}$ . Alloys mostly melt at a lower temperature than that calculated from the proportions of their components, and not uncommonly at a temperature below the melting point of any of their constituents. The different degrees of fusibility of metals is often resorted to in

metallurgy to separate two or more metals from each other by liquation, such as the separation of tin from less fusible metals, or bismuth from its gangue, or from copper or lead.

The metals are probably all volatile at high temperatures. Some sublime comparatively easily, and this peculiarity is utilized both in extracting them from their ores and in separating them from other metals. Arsenic volatilizes without fusing. Mercury boils at about  $350^{\circ}\text{C}$ ., cadmium at about  $860^{\circ}\text{C}$ ., and zinc at about  $1040^{\circ}\text{C}$ . The ores of these latter metals are reduced by suitable means, and the reduced metal distilled off and condensed. Many other metals are sensibly volatile at furnace heat, as lead, copper, gold, potassium, sodium, &c. The majority of metals expand on heating and contract on cooling, so that in casting objects to size it is necessary to make allowance in the pattern for this contraction. Some metals expand on solidifying. This is a particularly useful property in casting when a sharp impression is required. Bismuth is possessed of this property in a marked degree, and is added to many alloys used where a fine delineation is desirable; type-metal is an example.

Some metals, especially steel, can be annealed, hardened, and tempered by special treatment. Annealing is mostly effected by first heating and then cooling slowly; hardening by suddenly cooling the heated metal; tempering is produced by a judicious combination of the two preceding.

The more complex the ore is when received from the mine, the more processes it requires to be put through in order to reduce it or to obtain the metal in a free state. For some simple ores heat alone is necessary, as in the case of MERCURY ORES, but the majority require treatment with reducing agents, with or without the application of heat, while others again require special treatment.

Smelting is the operation of reducing the metal and separating it from the ore by the application of heat, with or without the addition of re-agents; these re-agents may be either reducing agents or fluxes—substances added that will combine with the gangue and earthy matter to form a fusible mass or slag. In smelting some ores an intermediate product is obtained before getting the reduced metal; when this consists of a fusible mass of mixed sulphides, as in the case of copper smelting, it is termed *regulus* or *matt*; when of arsenides, as with nickel and cobalt ores, it is called *spiege*.

The various operations adopted in the smelting of ores vary not only with the metal to be extracted, but with the ore to be operated upon. An account of these processes cannot be entered upon; a short outline of some may be found under the chief ores of the metals. Some of the general principles upon which the metallurgist acts may be briefly noticed here.

In the smelting of sulphides, such as the lead and copper ores, the ore is heated in a current of air, so as to oxidize a portion of it, forming oxides and sulphates. On raising the temperature the mixed sulphides (*matt*) are fused, and the sulphate or oxide reacting on this, the metal is reduced and sulphur dioxide escapes ( $2\text{MS} + 2\text{MO} + \text{MSO}_4 = 5\text{M} + 3\text{SO}_2$ , where M represents the metal). This result often requires several operations for its attainment, and other ores—oxides, carbonates, sulphates, &c.—are frequently added after the first roasting; fluxes also have to be added, according to the nature of the gangue, in order to produce a fusible slag—this is in a great measure attained by a judicious admixture of different ores, some with acidic, others with basic gangues. The operation of smelting these ores is carried on generally in a reverberatory furnace, the flame from the fireplace passing over the bridge and along the bed (on which the ore is placed) to the stack. In some localities cupolas or other forms of furnaces are used, and in some instances are replacing the reverberatory and older forms.

In smelting oxides, such as iron, in a blast furnace the

fuel, ore, and flux are supplied in successive layers at the top of the furnace; the fire is urged by a blast (hot or cold) from the tuyers below. As the charge settles down the metal becomes reduced and collects at the bottom of the furnace beneath the fusible slag, and is drawn off as pig iron from time to time as it accumulates. Other forms of furnace are also sometimes used. Both in this and the preceding cases the resultant metal is impure and requires to be refined; this often involves many and varied processes, according to the impurities present, the nature of the metal, and the purposes for which it may be required. In the case of iron the various kinds of cast and wrought iron, and different varieties of steel, are produced mostly from the crude pig metal. Some recent improvements in the producing of steel demand passing notice.

Steel is a compound of iron and carbon, the carbon being all combined. In pig iron a large portion of the contained carbon is uncombined or in the form of graphite. Malleable iron is almost pure iron; it contains a small percentage of combined carbon. Both steel and malleable iron are generally prepared from pig iron, after a process of refining, by several means. Of late years the introduction of *Bessemer steel* has caused a great alteration in their production. This, which may be described as a *steely-iron*, is produced by blowing a stream of air through a mass of molten pig iron, contained in a large vessel movable on a horizontal axis, and called a "converter;" the impurities carbon, silicon, and manganese are thus burned off. To this blown product is then added a highly carboniferous compound of iron and manganese  $\{(\text{FeMn})_2\text{O}_3\}$  called *speiseeisen*, which supplies the requisite amount of carbon to the steel; the manganese also, though most of it passes into the slag, has been found essential for the production of good metal by this process. The impurities sulphur, and more especially phosphorus, which render the metal respectively hot-short and cold-short, are not eliminated by this process; therefore it has been necessary to use pigs prepared from rich ores free from these ingredients. By a recent modification of Thomas and Gilchrist, in lining the converter with a basic material, as limo or dolomite, phosphorus is completely removed from the product; the poor ores of Great Britain and elsewhere are thus rendered available, and the phosphorus which collects in the slag is subsequently removed and utilized. The early races obtained a very pure malleable iron direct from the ore with the Catalan forge, which was not very unlike the ordinary forge-fire, the blast, however, being directed at an angle downwards on the charge. A somewhat similar method is still resorted to among some primitive tribes; the modern bloomery may be considered as the outcome of this process.

Tin is obtained from the ore cassiterite. This is reduced in a reverberatory furnace with culm and flux (fluor spar or lime), according to the gangue. The metal is refined by liqutation, the tin being sweated away from the less fusible copper and iron, and subsequently "poled," by being stirred up by wet wooden poles, whereby the impurities are oxidized and may be collected as a scum; on letting the residue stand the pure tin rises to the top of the pot.

*Nickel* and *cobalt* are obtained chiefly from very complex ores. Cobalt is mostly employed as smalt, and from the residuum "speiss" the nickel is subsequently extracted.

*Bismuth* and *antimony* are mostly separated by liqutation. The bismuth occurs native with a quartz gangue. On heating this in an inclined vessel the metal fuses and runs off. It is subsequently purified. Antimony is mostly obtained from the sulphide stibnite  $(\text{Sb}_2\text{S}_3)$ , which is an easily fusible mineral, and can be separated from the gangue by liqutation. This is then roasted and the metal reduced from it by charcoal and soda-ash; or the liquated sulphide may be fused with iron, yielding sulphide of iron and metallic antimony.

*Arsenic* volatilizes without fusing, but the commercial supply is chiefly obtained from the oxidation of arsenical ores, the arsenious oxide  $(\text{As}_2\text{O}_3)$  being collected in a series of chambers through which the gases are caused to pass before reaching the chimney. This is subsequently purified.

*Zinc* and *cadmium* are obtained by a process of distillation. The ore is mixed with a carbonaceous substance and heated in a closed vessel. Metallic zinc is reduced and sublimes off at a red heat. If the ore contains cadmium it comes off first, and this portion is saved for special treatment.

*Silver* is largely obtained from argentiferous lead ores; it is reduced with the metallic lead, and separated from it by a subsequent refining process. In Patterson's process for the desilverization of lead, the argentiferous lead is melted in one of a series of iron pots, and then allowed to cool till near the point of solidification crystals separate which are poor in silver, while the still liquid portion is proportionally richer in that metal; the crystals are transferred to the pot to the right, while the liquid goes to that to the left; in each of these the process is repeated, and so on to each end of the series. This results in the concentration, in the extreme left-hand pot, of a rich silver alloy, while to the extreme right there is lead almost free from silver.

In Parkes' process zinc is added to the melted lead. The zinc alloys with almost the whole of the silver and a little lead, and floats to the top. From this the zinc is volatilized subsequently. By whichever process the silver alloy is obtained, it is cupelled, the lead and other oxidizable metals being oxidized and blown off, leaving finally only pure silver with a little gold.

From silver ores the metal may be extracted by amalgamation, or by one of the numerous wet processes. In amalgamating the metal may be first reduced, or it may be treated directly by the mercury. The latter is a wasteful process, but is that long used in Mexico, and known as the *patio* process, which was invented in 1557. The ore is first ground in an arrastre, or rude kind of mill; to the pulverized stuff is added salt and magistral—a mixture of sulphate of iron and copper—and after some time mercury. The whole is then well mixed up in a suitable yard or *patio*, and frequently stirred; a series of chemical reactions set in which result in the reduction of the silver and formation of an amalgam, which is separated by washing.

*Gold* is widely distributed in nature; it occurs mostly native, either in quartz lodes or in small quantities associated with other minerals. Some of the most productive sources of gold are the alluvial deposits formed in the vicinity of auriferous rocks. From such deposits the metal is usually separated by washing, its specific gravity being so much greater than that of the stuff with which it occurs. To catch the minute particles mercury is employed; it amalgamates readily with the native metal. Several methods of washing are adopted; the pan or dish is probably the simplest, the stuff being agitated by giving the dish a peculiar motion with the hand. In the *cradle* the large stones are separated by a sieve, and the finer stuff is rocked with water in an inclined trough. The *long Tom* is a long inclined trough, in which the stuff is subjected to a gently running stream of water. The most advantageous method of treating the stuff, where it can be adopted, is the hydraulic method used in California; here a powerful jet of water is projected from a large hose against the bank of gravel; this breaks it down, and the water with the suspended particles, as it runs off, is treated in long troughs (flumes) often miles in length, in the bottom of which mercury is placed. Under favourable circumstances stuff containing not more than one millionth part will pay for working by this method; but the preliminary expenses, bringing the water under suitable

pressure and tunnelling under the stuff, are very heavy. Gold occurring in a quartz lode is usually accompanied with sulphides and arsenides, which require to be removed by roasting. The quartz is reduced to a very fine state of division by stamps and pulverizers, and then treated with mercury in an amalgamating pan; from the amalgam the gold is obtained by volatilizing the mercury. Of the remaining metals that are used in the arts, it must suffice to mention that aluminium and magnesium are obtained by reduction with sodium, and mercury is obtained by a rough process of distillation.

**METALS**, a class of simple or elementary bodies, as distinguished from the non-metallic substances, frequently but improperly called *metalloids*. They are at present supposed to be upwards of fifty in number; namely, aluminium, antimony, arsenic, barium, bismuth, cadmium, caesium, calcium, cerium, chromium, cobalt, copper, didymium, erbium, glucinum, gold, indium, iridium, iron, lanthanum, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, niobium, osmium, palladium, platinum, potassium, rhodium, rubidium, ruthenium, silver, sodium, strontium, tantalum, tellurium, terbium, thorium, tin, titanium, tungsten, uranium, vanadium, yttrium, zinc, and zirconium. This catalogue is constantly liable to be increased by new discoveries, while on the other hand, the distinct nature of some of the above may be disproved. The right of certain bodies to be regarded as metals is a matter of grave dispute. Thus arsenic, boron, selenium, silicon, and tellurium are alternately pronounced to be metallic and non-metallic, according to the varying weight assigned to certain analogies. Even hydrogen, a permanent gas and the lightest of all known bodies, has been pronounced a metal, the type of the so-called magnesian group. Hence we see that, like most binary antagonistic classifications, the division of bodies into metallic and non-metallic is of exceedingly little value, and cannot stand a critical examination. With the exception of mercury, which is liquid, all the metals are solid at ordinary temperatures, though potassium is soft as wax at the heat of the human hand. All are fusible save arsenic, which when heated passes at once into a state of vapour without liquefaction. Their melting points vary, however, exceedingly. Thus while potassium fuses at  $58^{\circ}$  C. ( $136^{\circ}$  Fahr.) titanium, platinum, iridium, and tantalum withstand the most intense heat of an ordinary furnace.

Some metals are readily volatilized at moderate temperatures, and may in consequence be distilled. Among these are mercury, potassium, sodium, zinc, cadmium, arsenic, and tellurium, while others may be maintained for a long time in a state of fusion without any perceptible loss.

The metals are of all substances the best conductors of heat. If the conducting power of gold be assumed = 1000, that of platinum is 981, of silver 973, of copper 898, iron 374, zinc 363, tin 304, lead 186. Their capacity for heat follows a different series, bismuth and lead ranking first.

The facility with which metals conduct an electric current varies with the temperature. At  $32^{\circ}$  Fahr. the series is as follows:—Silver, copper, gold, tin, iron, lead, platinum. According to Pouillet each of the following metals is electro-positive towards those which succeed:—Zinc, lead, tin, iron, antimony, bismuth, copper, mercury, silver, gold, tellurium, palladium, platinum. It must, however, be remembered that the relative electric position of a metal is liable to be modified by the nature or even the degree of concentration of the liquid—acid, alkaline, or saline solution—with which it is in contact. The following metals are capable of being rendered *magnetic*, that is, of being attracted by either pole of a magnet, and when suspended between two magnetic poles, of pointing in a straight line between them:—Iron, nickel, cobalt, manganese, chromium, cerium, titanium, palladium, platinum, and osmium. The

remaining metals are *diamagnetic*, that is, are repelled by either pole, and if suspended between two magnetic poles, point at right angles to the line of connection.

Copper and titanium are reddish, and gold yellow, but the remaining metals are all of various shades of gray; when in a very fine state of subdivision they appear black.

The lustre, known as *metallic lustre*, is peculiar and characteristic. The metals differ, however, very considerably in the degree in which they possess this attribute, and in many it is only temporarily elicited under the burnishing steel. The metals are generally considered perfectly opaque, even when reduced to thin leaves. Gold leaf, however, which is only 1-200,000th of an inch thick, transmits a faintly greenish light. It is probable, therefore, that the other metals also would be semitransparent could they be rendered sufficiently thin.

The high specific gravity was formerly supposed a characteristic attribute of metals—a notion overturned by the discovery of potassium and sodium, which are so light as to float upon water. Gold and platinum are the heaviest bodies known, the density of the latter being 214.

Some metals, such as gold, silver, copper, tin, lead, cadmium, zinc, iron, platinum, palladium, potassium, sodium, nickel, and frozen mercury, are malleable, i.e. admit of being hammered out into plates or leaves. The remainder are more or less brittle, and some, such as arsenic, antimony, and bismuth, are readily reduced to powder. Gold is the most malleable. Certain malleable metals are ductile, or capable of being drawn into thin wire. Gold, silver, platinum, iron, and copper are most to be noted in this respect. The ductility and malleability of the same metal are not always in proportion. Iron is the most tenacious, and steel and chromium the hardest metals. The structure of metals is lamellar, granular, fibrous, or crystalline. Bismuth, tin, and zinc assume a crystalline form.

In a chemical point of view metals are divided into *light* and *heavy*. The former when united with oxygen yield alkalies and earths, while the latter under the same circumstances form what are known as metallic oxides.

All metals may be combined with oxygen. Some take up this element at common temperatures from air or water, while others—the so-called *noble* metals—can only be oxidized by the aid of acids, and readily resume the metallic state. Some of the oxygen compounds of metals are acid, others basic, and others again, the suboxides and peroxides, play neither part.

Metals form numerous and important compounds with chlorine, bromine, iodine, fluorine, and sulphur; but their combinations with hydrogen, nitrogen, carbon, and boron are few and in general of little moment. The compound of iron and carbon known as steel is an important exception.

Among themselves metals form a class of compounds known as alloys. These are generally harder and more elastic than the metals of which they are composed, and are in consequence of great utility in the arts and manufactures. Brass, bronze, pewter, white metal, German silver, bell-metal, type-metal, solder, and the compounds of silver and gold used for coinage and jewelry, are the most important.

Most of the metals are readily soluble in acids. Platinum, however, can only be dissolved in hot concentrated nitro-muriatic acid, and upon iridium even this acts but feebly.

**METAMORPHISM** is the name given in geology to that change which has taken place in some derivative rocks, and promoted in them a crystalline structure and an aspect more or less resembling true igneous or plutonic rocks. That they are not of igneous origin is evident from their bedded structure, some of the beds being comparatively unaltered and containing fossils, interstratified limestones also occurring. Not uncommonly highly altered rocks can be traced passing gradually into rocks evidently of normal

sedimentary origin. The precise cause of the alteration is a matter of some uncertainty, but that pressure and heat—with or without the presence of water—are potent agencies, there is little reason to doubt. At least three distinct kinds of metamorphism can be recognized, due apparently to somewhat different causes.

**Local metamorphism**, or that found in the vicinity of intrusive and eruptive rocks, is of comparatively limited extent; it consists of a baking and hardening along the confines of the intruded rock. The zone so affected varies with the size of the igneous rock. Frequently between lava flows the rocks are found to be indurated and porcellanized by this influence, but whereas the rocks on both sides of an intrusive mass are affected, in the case of eruptive rocks it is only the beds immediately beneath the lava flow that suffer this change. The various kinds of rock are of course altered differently both in degree and in resultant product. Shales and clay rocks are converted into hard and generally compact flint-like rocks; those containing pyrites and protoxides of iron have usually a burnt or reddened aspect. Sandstone and quartzose rocks are variously affected according to their accessory constituents, and limestones are rendered more crystalline or converted into saccharoid marbles; to this latter change the term *nymmarosis* is sometimes applied. Numerous examples of this local metamorphism or *paroptesis*, as it is sometimes termed, are to be found both among ancient and more recent formations. At Portrush, in the north-east of Ireland, the Lias shales are converted into a hard flint-like rock, closely resembling a compact fine-grained basalt, but in which the fossils, especially *Exogyra*, are still well preserved. Beneath the basaltic flows of Antrim the chalk is converted into a compact and hard stone—the white limestone—breaking with a flint-like or conchoidal fracture.

**Regional metamorphism** affects areas on a larger scale. Large districts are often found composed of these rocks in which the bedding is still quite apparent and usually quite regular; but whereas one bed may be a highly crystalline rock, either gneiss or apparently a true granite in composition, the adjoining beds may be comparatively unaltered slates or mica schists, or even crystalline limestones of a bluish-gray colour. When examined on a large scale these rocks are found generally to be plicated and folded; and it is to be remarked that the more the strata are folded the more intensely are they altered. Foliation is associated closely with metamorphism; the minerals appear to develop in parallel planes, sometimes coincident with the stratification, at other times with the cleavage, when such existed.

In the case of local metamorphism it is evident the change from ordinary sedimentary rock has been brought about by proximity to an intensely heated mass of molten rock; in the case of regional metamorphism it is different. Here the strata are of such a thickness and altered over such vast areas that another cause must be sought. The explanation most generally accepted is that of aqueo-igneous fusion, which is supported by the experiments of Daubrée. According to this theory, since their deposition these strata have been depressed under a considerable thickness of superincumbent deposits. When in this position, and under considerable pressure, they were subjected to an elevation of temperature, consequent upon their being further from the surface of the globe, and possibly aided by the heat produced by the crushing of the rocks. At a comparatively moderate temperature it has been found that rock-material, containing a small percentage of interstitial water, undergoes a gradual change, whereby new minerals allied to the constituents of gneiss and granite are formed. It is therefore supposed that the majority of these metamorphic rocks have been formed by an incipient fusion, under great pressure and in the presence of water. To metamorphism of this kind the term *metapexis* has been applied. It is by far the most abundant type of metamorphic action, and is

to be found in almost all mountain chains and areas of disturbance, as well as in districts that in some former geological period represented the axis of a mountain range, since removed by denudation.

The third type of metamorphic action is that produced by chemical action, to which the term *methylosis* has been applied. It may be due to the reaction of certain constituents of rock upon each other, or it may be due to the effect of meteoric waters or other solutions on particular beds of rock. Thus many granites undergo a sort of decomposition or disintegration, which converts them into growan or sometimes kaolin, even to considerable depths. The same is true of some elvans and certain other igneous rocks found in dykes and sheets. A remarkable instance of methylosis is to be found in the formation of certain serpentines, as those of the Lizard, Cornwall, which are altered diallage-rock, a variety of igneous rock. Many of the serpentines of the Laurentian formation of Canada appear to have had a similar origin. The induration and silicification found affecting the country rock along the confines of a lode or other mineral deposit, and often penetrating certain beds formerly porous, belong to this class of phenomena, and has probably been effected by a hot solution bearing silica in solution, that flowed through the fissure where the lode has formed.

There is almost an infinite variety of metamorphic rocks; the most commonly occurring are, however, the various schists, as mica-schist, hornblende-schist, &c., named after one of its chief constituents, and the several gneisses passing into metamorphic granite. It is being gradually conceded by geologists that a number of the rocks formerly considered as of igneous or plutonic origin are more probably due to metamorphic action, and many consider it as possible that volcanic rocks are but an extreme stage of the same action, which has resulted in the complete fusion and ejection of the rock.

#### **METAMORPHOSES OF ANIMALS.** See LARVA.

**METAPHYSICS.** Metaphysics is a word which has received definitions various and apparently contradictory, but the most important of which are, nevertheless, ultimately reconcilable. The best agree in representing it as the science of the primary principles of human knowledge, or that which determines the ultimate meaning, foundation, and limits of our beliefs. And as the solution of its principal problems implies a systematic study of mind, it has also been described as the science of the facts or phenomena of consciousness—the fundamental facts in the universe. As expressive of summary or ultimate science, or at least of the aspiration after it—the aspiration after the purification and perfection of our intellectual life—metaphysics and philosophy are used often as synonyms.

The origin of the term metaphysics is obscure. It was probably first applied to those books of Aristotle which profess to unfold a Science of Being, and which, in the arrangement of his works, followed his *Physics*. They were accordingly called by his editors “those after the *Physics*” (Gr. *ta meta ta physika*); but whether on account of their position or because it was thought they should follow the *Physics* in the educational course is uncertain. This, then, is the accurate meaning of metaphysics—the body of inquiries on the subjective method into the nature of things lying outside human experience and the possibilities of experience, such subjects as God, freedom, immortality, cause, existence, &c. *Ontology* is another name, and *philosophy* in its restricted sense yet another. Of the futility of this kind of inquiry most men are now convinced. Many believe they have divine revelation as to the higher order of things, and in this they trust with awe and reverent faith; but to speak of *knowing* such things is to use the language of bygone times. From Aristotle down to the beginning of our own century the problem has been attacked, and no progress has been or ever can be made.

But with the remainder of what came to be included under the term metaphysics, viz. inquiries on the objective method into the principles of thinking, the habits and the limitations of the mind, the origin of knowledge, the foundations of morality, and the like, this charge of futility does not hold. These things are grouped together in the studies now called *psychology* or mental science, and *ethics* or moral science; and as we are here dealing with matters of experience subject to examination and verification, we can make good progress and increase our knowledge of ourselves in a most valuable and reliable manner. Consequently, since the allurements of metaphysics proper have been shaken off, these once subordinate inquiries have taken their true place, and every year adds to their value and completeness.

It is still necessary, however, to be cautious when dealing with the word metaphysics to ascertain what connotation the author means to attach to the term he is employing, for it even yet appears to be loosely used as covering mental and moral science by writers who should know better. Fortunately this number diminishes yearly.

**METASTASIO, PIETRO**, an Italian poet. His real name was Trapassi (for which the pseudo-Greek equivalent is Metastasio), and he was born of humble parents at Rome in 1698. He early showed his great talent, and at fourteen wrote a tragedy which had success. He studied hard, and to give himself a profession assumed the minor orders of priesthood. Gravina, his steady patron, left him his property at his death in 1718. In 1730 Metastasio was at Vienna, and became the court laureate there. His lyrics are very musical, and if rather full of conceits are always exquisitely polished and graceful, and his opera libretti rank among the best ever written. He had a consummate knowledge of the needs of the musician, and his songs and libretti were eagerly sought for. The list of his dramas amounts to eighty-three. He died at Vienna in 1782. He was a mass of affectation, especially on the score of alleged ill-health, although in reality he was robust. His letters, published at Bologna in 1883, are full of interest for the student of those times, especially the correspondence with his "twin-brother," as he styles the famous singer, Farinelli, unofficial prime-minister of Spain under the half-mad Philip V. Hoole's translation of a large selection of dramas and poems (London, 1800) is very clever. The best Italian edition is that of Mantua, in twenty volumes (1816-20).

**METELLUS**, the name of one of the most famous families of ancient Rome, a plebeian family of the Cæcilian gens or clan. There are a great many famous Cæcili Metelli in the long history of the republic; perhaps the most remarkable of this distinguished series of men are the following:—

*Lucius Cæcilius Metellus*, the conqueror in Sicily of Hasdrubal, not the brother-in-law nor the brother of Hannibal, but a Carthaginian general of the generation preceding. Hasdrubal had been supreme in Sicily from 254 B.C., and the danger to the very existence of Rome was imminent. In 251 B.C. Metellus as consul crossed to Sicily, and within a year he totally defeated his antagonist. On returning to Carthage Hasdrubal met with the common fate of a defeated general of the great African city: he was put to death (250). This virtually closed the first Punic War and settled Rome as mistress of the world. Metellus was again consul in 249, and became pontifex maximus in 249, a dignity retained till his death. He was dictator in 224, and died two years later. His son *Quintus* filled many offices of the republic, and was one of the legates who brought to Rome from Nero's army the news of the death of Hasdrubal, the brother of Hannibal, rendering it impossible for the mighty Carthaginian to receive succour by land. *Quintus* was consul in 206 B.C. and himself commanded against Hannibal in Bruttium. He

was dictator in 205, and was otherwise a distinguished servant of the republic till his death.

*Quintus Cæcilius Metellus*, surnamed *Macedonicus*, was the son of Hannibal's opponent. His great achievement was the reduction of Macedonia and the overthrow of the Achaean League, 146 B.C. After a splendid public triumph at Rome he received the honourable surname of *Macedonicus*. He filled all the great offices, and when consul distinguished himself in war with the barbarians in Spain. Ancient writers record his unblemished career with envious approbation, and note that when he died, in 115 B.C., one of the most honoured men of the republic, he was borne to the grave by four sons, one of whom was actually consul at the moment, another was then standing for the consulate, and the other two had already been consuls. His eldest son had the surname *Balearicus* for distinguished services in the Balearic Islands, and his nephew *Lucius* was styled *Dalmaticus*, having conquered the Dalmatians in his consulship, 119 B.C. *Dalmaticus* served most of the great offices, and he is the Metellus who was one of the leaders of the aristocratic rising against Saturninus (100 B.C.), when his more distinguished brother was driven into exile.

*Quintus Cæcilius Metellus*, surnamed *Numidicus*, brother of *Dalmaticus*, last named, was even more famous than his ancestors. His surname was gained by his successes against the notorious Jugurtha, king of Numidia, 109 B.C. Jugurtha's gold could not buy the integrity of Metellus, who was one of the very few unsullied spirits of that corrupt time. Although Marius reaped the glory of conquering Jugurtha, the work had been brought to the point by Metellus, and it was a bitter disappointment to him to find his plebeian lieutenant elected consul with the deliberate purpose of assuming honours justly due to himself. However, Metellus on his return to Rome was the idol of the aristocratic party, and he celebrated a splendid triumph and was honoured with his well-earned surname. He continued to fill great offices, and to use his enormous influence against the popular party. In 100 B.C. Saturninus, who had out-distanced Marius in the favour of the mob, was tribune for the second time, and brought in an agrarian law for free distribution of land and corn. Sure that the great Metellus would oppose the unwise measure, which indeed was merely a political trick to catch votes, Saturninus procured a vote of the popular assembly ordering the senate to swear to observe this law. Metellus haughtily refused. The senators, among them his brother *Dalmaticus*, took up arms; but he declined to be the cause of civil war, and went into banishment at Rhodes. His son Q. C. M. Pius, and his cousin's son Q. C. M. Nepos, both of them important men at the time, used every exertion in his behalf, and he was recalled next year (99 B.C.). His orations are praised even by Cicero as models of dignified eloquence.

*Quintus Cæcilius Metellus*, surnamed *Pius*, because of his filial affection to his banished father, was the son of *Numidicus*. He commanded in the deadly Social War in 89 B.C. when prætor, and was still campaigning in 87 when the aged Marius, half-mad with thirst for revenge, arrived from exile to stand for his famous seventh consulship. The aristocratic party forced Metellus to return to Rome, on which Marius and Cinna were advancing in great force. Metellus was wise enough, however, to see that the moment had not yet arrived. After testing the troops and finding them untrustworthy and the leaders disunited, he crossed to Africa. In 88 B.C. he was able to join Sulla with an important force and unite with him in the invasion of Italy and the stamping out of the Marian faction. He was consul with Sulla in 80, and was commander in Spain against Sertorius, who was endeavouring to rally the broken Marian or popular party there, 79 to 71 B.C. Pompey was sent to his help 72 B.C., with a second army, and the assassination of Sertorius enabled the two generals at last to reduce the province to submission. Me-

tellus, like many of his ancestors, was chief pontiff, and his successor in the office at his death in 63 was Julius Cæsar.

Two sons of that Metellus Nepos who so warmly aided Pius in his affectionate efforts for the recall of the aged Numidicus, also rose to distinction in the generation immediately succeeding Pius. These were both named *Quintus Cecilius Metellus*, but the elder gained the surname of *Celer* (the swift) from his dash in warfare, and the younger retained his father's name of *Nepos*. *Metellus Celer* first became known as legate of Pompey the Great in Asia 66 B.C., and was later on, when prætor, an ardent supporter of Cicero in his action against Catiline, during his famous consulate in 68. In fact, it was his swiftness in out-marching Catiline and blocking up the passes into Gaul which threw the rebel leader back upon the legions of Antonius, the colleague of Cicero in the consulship. He was later on set in supreme command over (Italian) Gaul as præconsul, and rose to the consulate in 60, when he displayed a commendable firmness against the arrogant policy of Pompey in Asia. He died in 59, not without suspicions of poison. His brother, *Metellus Nepos*, was also legate with Pompey in the pirates' war and later, and became tribune in 68, especially to favour the views of his great leader. This brought him into violent opposition with his brother Celer and the whole Ciceronian clique. He even went so far as to use the all-powerful tribunitian veto to prevent the consul (Cicero) addressing the people, as was customary, upon his leaving office. Next year Metellus brought forward a bill summoning Pompey, with his whole army, to come and heal the disorders of the state. Rome plunged into open civil war upon this, and Metellus had to fly. He returned together with the leader he had so blindly served in 61, and became prætor in 60 and consul (with Spinther) in 57. As consul he was magnanimous enough to sanction the recall of his old enemy Cicero. He ruled Spain as præconsul in 66 and died the following year.

A little later than these three brothers is *Q. C. Metellus Pius Scipio*, not really a Metellus, but a son of P. Scipio Nasica the prætor, and adopted by Metellus Pius. He stood for the consulship in 58 against the notorious Milo, and was supported by the mob who followed Clodius, Milo's old enemy; such scenes of violence occurred that the election could not be held. Clodius was murdered, Pompey became sole consul, married the daughter of Metellus Scipio, and raised the latter to the consulship. Henceforward, Metellus Scipio was devoted to Pompey's cause. He was cruel, avaricious, and oppressive to a degree remarkable even in that time of disorder. He governed Syria in 49 (with shameful rapacity), and joined Pompey in Greece in 48, commanding the Pompeian centre at the battle of Pharsalia. After the defeat at Cæsar's hands he fled to Africa and became Pompeian leader there. Again he was overthrown by Cæsar at Thapsus in 46, and he then put an end to his life.

Three brothers of another branch of the family of Metellus were also among the leaders of the aristocratic party in these troublous times. The eldest and best known of the three is *Quintus Cecilius Metellus Creticus*, who during his consulate brought the island of Crete into submission to Rome (69 to 66 B.C.) Pompey refused him his well-earned triumph, and he waited without the walls of Rome for nearly four years, helping his party in the Catiline outbreak, &c., until in 62 B.C. his services were acknowledged and he entered Rome at last in triumph, receiving his surname of *Creticus*. He had his revenge on Pompey by joining the cabal against his government in Asia. His brother Lucius followed Verres in Sicily as governor, 70 B.C. Although he must have seen the widespread ruin that the rapacity of Verres had caused, known to us by Cicero's magnificent invective, yet he was foremost in shielding the criminal from justice. He was consul in 68. The third

brother, Marcus, was then prætor, and according to the routine should have been Verres' judge. An acquittal of a governor who had simply plundered the province he was set over would have been a national calamity, and it was avoided only by the swiftness of Cicero, who had got together the evidence of his case in half the time allotted, and pleaded it before the year of office of Marcus Metellus began.

#### METEORITES. See AEROLITES.

**METEOROL'OGY**, derived from the Greek adjective *meteōros*, signifying suspended in the air, is the science which treats of the atmosphere and the various causes which affect its condition. The most important of these are the variations in temperature and humidity, which by their combined effect produce variations in pressure, wind, and rain (or other downfall).

For information relative to the *chemical constitution* and the *mass* of the atmosphere we must refer to the article **ATMOSPHERE**.

**Temperature**.—The temperature of the atmosphere and of the surface of the earth are dependent on the amount of heat received by radiation from the sun, and also inversely on the amount radiated away into space. It is probable that the atmosphere presents less resistance to the admission of heat from the sun than to its escape from the earth, so that the presence of the atmosphere tends to make our globe warmer, and to counteract the incessant radiation of the earth's own heat into space. The lower strata of the atmosphere are warmer than the higher, and have nearly the same mean temperature as the surface of the earth. On an average the winter's cold about matches the summer's heat. Fig. 81 (Plate III.) is a diagram which attempts to show the compensating absorption of solar heat in summer and its radiation in winter. It is an ascertained fact that were the earth's surface at a mean temperature, and the sun's rays suddenly cut off, it would require thirty days to cool it by 7°; and were they then renewed, the original temperature would not be attained till after the lapse of the same time. The oblique circle bearing the signs of the zodiac stands for the varying declination of the sun, and the irregular line which intersects it in something like opposite nodes represents the curve of temperature for the year. The area comprised between the line of temperature and the sun's path, and shaded with parallel lines, represents the cold of absorption, and the opposite part, shaded with dots, the heat of radiation. A like figure may readily be constructed to show the daily vicissitudes of temperature, which are no less remarkable, though less evident in their compensation, unless a large body of observations is shown in separate diagrams.

In general the temperature of the surface of the earth and of the lower strata of air is greatest near the equator, and diminishes as we recede from it—a difference which is obviously owing to the greater obliquity of the sun's rays with increasing latitude. But other causes modify this effect, and, in fact, the system of **ISOTHERMAL LINES**—i.e. lines drawn through those places which have the same mean annual temperature—is found to differ very considerably from the parallels of latitude. [See that article and its accompanying Plate.] The hottest portion of the land is Central Africa, about 10 degrees north of the equator, and the hottest portion of the open sea is in the Pacific, a few degrees south of the equator. In like manner the north pole is not the coldest part of the northern hemisphere. It appears that there are two poles of cold—i.e. centres of greatest cold in the northern hemisphere—both situated between lat. 75° and 80°, one of them to the north of Siberia, the other to the north-west of Baffin's Bay. The mean temperature of the British Isles is much higher than that of most places in the same latitude, being for the centre of Great Britain about 50°, which is the same as that of New York, although the latter place is about 18 degrees further south. The high mean temperature of the



British Isles is owing to the prevailing south-west winds, which blow from a warm region of the Atlantic, and arrive at our shores laden with warmth and moisture. These winds in their course pass over the GULF STREAM, which is a current of warm water of great breadth and depth flowing through the ocean from the Gulf of Mexico. [See the articles ATLANTIC OCEAN and OCEAN.] One of its branches takes a north-easterly course past the coast of Ireland, Scotland, and Norway, and has been thought to contribute materially by its vicinity to the relatively high temperature of these countries; but meteorologists are not now inclined to build so much upon this theory as was once the case.

But the climate of a place, as regards temperature, depends not only on the mean temperature—i.e. the average of all times of the year—but also very much on the *range* of temperature—i.e. the difference between the hottest and coldest times. Small islands in the midst of large oceans have always a very small range of temperature, while the interior of large continents has a very large range. This difference is caused by the different properties of land and water as regards heat. The heating of land by the sun's rays takes place principally at the surface, which is many degrees warmer in summer and colder in winter than the soil a few feet deeper; the intermingling of the waters renders any considerable difference of temperature in the ocean impossible, except at considerable depths or in cold currents. Another obstacle to variations of temperature at sea is the latent heat of aqueous vapour—increased of temperature producing increased evaporation, which is a cooling process; while, on the other hand, when much moisture is present in the air a fall of temperature produces condensation, a warming process. The equable climate of Great Britain, which is warmer in winter and cooler in summer than the Continent of Europe, is mainly owing to the amount of moisture present in its atmosphere, arising from the vicinity of the ocean.

*Humidity* is the second great division of meteorology and the other great factor in climate. The amount of water which can be held in the form of vapour within a given space of air depends chiefly on the temperature; the warmer the air the greater is the quantity of vapour that it can contain. Vapour is never absent from any portion of the air which we breathe; and, on the other hand, it is very rarely that the full amount of vapour which can be contained is actually present. When this full amount is present the air is commonly said to be *saturated*, and if still more vapour be present this condenses into the form of clouds. In the article CLOUD the usual forms of these lovely agglomerations of "water dust" (to use Professor Tyndall's happy phrase), or of ice dust, it may be, are fully given, and to a limited extent effects of sunlight and shadow on clouds are touched upon; but a further consideration of these may now fittingly be made, since they form the most artistically beautiful phenomena which the meteorologist has to study.

*Effects of Sunshine and Cloud-shadows.*—It is from the inequalities of light and shade which the clouds display that we derive all our notions respecting their apparent dimensions and their irregularities of form, indeed all our knowledge of them except their outline. However wanting in density they may be, as compared with ordinary terrestrial objects, they are yet sufficiently dense to cast well-defined shadows, and it is by the shadows cast by prominent masses upon the rest of the cloud that we perceive the true nature of its surface. The motion of the sun, but far more that of the cloud itself, both as carried along by the wind and as shifting its figure within itself, cause these shadows to vary from moment to moment so completely, that the most expert and rapid sketcher often finds himself at fault in endeavouring to put upon paper the beauties he admires.

But there is another and equally interesting class of shadows which is not so prominent. The quickly-passing shadow cast over a sunny landscape by a cloud coming between us and the sun is a familiar and beautiful effect; but it is often overlooked by careless observers that the air is full of shadows cast by clouds, just as definite as those which, by falling upon the earth, give us the grateful shade we enjoy in summer, and which diversify the hues of our landscape. These shadows are clearest seen when thrown by one cloud upon another cloud, as shown in the diagrams of Plate I. (See the Plates illustrating this article.) The second cloud in fig. 1 will appear to the spectator as in fig. 2, and the second cloud in fig. 3 will appear as in fig. 4. Often small clouds at some distance (so that one has to search occasionally for the cause of the phenomena) will throw their shadows in curious bands or spots of dark upon some greater mass, as in fig. 5, producing the most unaccountable effects; or a haze at sunset will be darkened beneath in a remarkable manner, till on ascending a hill between us and the sun we detect the cloud whose shadow has produced so great a result. Sometimes these cloud-shadows are so delicate that they can only be traced by their effects upon smaller masses, as in fig. 10, where the difference between the shaded and bright cirri should be far less marked than it is in the Plate. On a bright day, with definitely fleecy clouds floating in a blue sky, the cloud-shadows can be traced in the sky itself quite easily; but as the shadows are less broad when looked at perpendicularly than when seen at an oblique angle, they may not always be so distinctly visible overhead and near the cloud as elsewhere. Fig. 7 shows this clearly. When these shadows move in long lines across the sky they exercise a peculiar fascination upon the observer.

The bursts of sunlight through clouds are among the most gorgeous of all the many splendid sights of the sky. The sun between two banks of cloud, nearing his setting, as in fig. 8, is an object beyond description magnificent. The peaks of cloud which intercept the sun's rays and fleck the sky with bars of light and shade form the well-known appearance of fig. 8, and occasionally a similar result is more vividly attained with the startling contrasts of fig. 11. In rainy weather the sun (who has not rejoiced to see it?) often bursts through the rents of the fissured clouds and scatters his beams over the whole landscape, gladdening the traveller with such a scene as that attempted to be shown in fig. 12. The counterpart of this is the sheaf of upward rays like that in fig. 13, often among the brilliant magnificences of sunset.

But also objects on the earth, when the sun is low, may be seen to cast shadows into the air by any painstaking observer. An example is given in fig. 14. Sometimes when a mist covers the base of a cliff shadows may be seen upon it, as in fig. 15, giving an effect somewhat akin to the famous Spectre of the Brocken.

In passing through thin clouds light suffers decomposition, as may be conjectured; thus in fig. 16 a ray passing through the top of the cloud would emerge nearly white, but rays passing through the greater thicknesses beneath will become tinted, thus gently colouring the face of the sky. Or a ray passing through several thin clouds in succession, as in fig. 17, will become more and more tinted by the absorption of part of the prismatic colours which go to make white light, and by leaving, therefore, the balance as colour. If the blue rays are absorbed the cloud will show orange, and so on. When such a series is seen in foreshortened perspective, as in fig. 18, the gradual blending of the tints is inexpressibly delicate and beautiful. Fig. 19 attempts to show a not unfrequent sky, when a heavy cloud obscures the sun and nearly the whole vault, but is caught by the vivid light behind it at its lower edge, and from this point a line of splendour faintly illuminates the flying scud as



in small detached masses it rapidly fleets by. Scattered clouds, as in figs. 20, 21, differ in their colours as the angle of the rays which illuminate them differs, and often change in tint with a rapidity inexplicable unless one puzzles out some such grouping-plan as here shown.

Nothing is more delusive than the solidity of clouds. Numerous lenticular masses, as in fig. 26, will, when the light strikes obliquely into them, so cast shadows on one another as to blend into the mass of bank shown in fig. 22; it is only when the sun descends, as in figs. 23, 24, that his beams penetrate between the masses and show the true structure of the cloud-bank, and if these banks of cloud are not too thick to let the sun's rays pass, they become gloriously coloured, as in fig. 27, the portions beyond the sun's disc remaining gray as before. Or often when the sun plunges into an apparently dull immovable haze, as in fig. 28, the magic of his beams reveals a lovely lace-like structure of rapidly moving fibres, and discloses the fact that this apparent torpor is made up of exquisite form and motion. In fact it is merely considerations of space which limit us in noticing the absolutely endless variety of aerial effects of sunshine and shadow among the clouds and over the face of the sky.

For other visible forms of vapour in the atmosphere see the articles FOG and MIST, and for other splendid artistic effects belonging to the sky see HALO, RAINBOW, and AURORA BOREALIS.

*Invisible Atmospheric Vapour.*—When the amount of vapour present in the atmosphere is less than usual we experience a feeling of harshness in the air; on the other hand, an excess of vapour produces a feeling of closeness. In the former case perspiration is rapidly evaporated, and the skin has consequently a tendency to dryness; in the latter case, from slowness of evaporation, perspiration speedily becomes sensible.

Since the amount of vapour necessary for saturation increases with the temperature, it is obvious that by lowering the temperature we produce an approach to saturation. When air (containing vapour) is cooled to such an extent as just to produce saturation, it is said to be cooled down to its *dew-point*. If it is cooled below this point a portion of its vapour will pass from the gaseous to the liquid form, and will be deposited in the form of DEW or RAIN; or if the weather be freezing, in the form of HOAR-FROST. Dew is produced by the cooling of the ground below the dew-point of the air in contact with it; while rain is caused by the cooling of a mass of air below its dew-point. All these questions of precipitation are grouped in the term *hyetometry*. The humidity of a mass of air is the ratio of the vapour actually present in it to the quantity of vapour requisite for saturation. In this sense one portion of air may be more moist than another, and at the same time may contain less weight of vapour per cubic foot. See the articles HUMIDITY and *HYGROMETRY*.

*Pressure, tension, or elastic force*, is another variable quality of air. To understand the idea conveyed by these names (which are used interchangeably), it must be premised that every gas or mixture of gases has a tendency to expand, and exerts an expansive force equally in all directions, so that if confined in a cubical box with two sides horizontal and the other four vertical, the pressure exerted on all six sides would be the same. This expansive force is usually expressed in terms of the pressure exerted on each square inch of surface in contact with the gas; thus, the mean pressure of air in the latitude of London, at the level of the sea, is 14·7079 lbs. per square inch. If there were no movement in the atmosphere, the pressure per square inch at any place on the earth's surface would be equal to the weight of a vertical column of air one inch square, extending through the whole depth of the atmosphere. From this connection between pressure and weight of air, the name "barometer" (literally, weight-measure)

has been given to the instrument which really indicates, not the weight, but the pressure of the air. [See BAROMETER.] From the habitual use of this instrument, in which the pressure of air is balanced by the weight of a column of mercury, it is common to speak of the pressure of the air, or of any constituent of the air, as being so many inches of mercury. The mean pressure at sea level in the latitude of London is 29·956 inches, the mercury being at the freezing point of water.

The variations which occur in this element are mainly due to variations in temperature and moisture. Air when warmed expands, and consequently becomes specifically lighter, thus acquiring a double tendency to rise above the surrounding air; and when it has so risen it must, from the tendency of fluids to find their own level, overflow laterally. The addition of moisture affects air in two ways: first, by increasing its mass or total quantity; secondly, by rendering it specifically lighter, in virtue of the fact that steam or vapour of water is lighter than air at the same temperature. When vapour is condensed into rain, and still more when it is frozen into snow or hail, the temperature of the containing air is raised by the latent heat given out by the vapour. These causes concur to produce both vertical and lateral movements of air, and when from these or other causes an excess of air is accumulated over any region of the earth's surface, the increase of pressure thus produced will be indicated by a corresponding rise in the barometer.

*Wind* is, in the first instance, the direct result of difference of pressure. When a body of air is pressed with greater force on one side than on the other, it yields to the greater pressure; hence, as a rule, the wind blows from regions of high to those of low barometer, and whenever the barometer falls unusually low a storm of wind generally follows.

The phenomenon of *land and sea breeze*, so well known in tropical regions bordering on the sea, is produced by the unequal heating of land and sea. During day, the sun's rays render the land very warm, while they have comparatively little effect on the temperature of the surface of the sea. Hence the air over the land becomes warmer and lighter than that over the sea, and when the former ascends in virtue of its lightness, the latter rushes in to supply its place—thus producing the agreeable sea breeze which usually sets in late in the afternoon, and is delightfully refreshing to the inhabitants. At night the reverse effect takes place. The land radiating away its heat to the cold sky, becomes colder than the sea, and the air incumbent over it becoming specifically heavier, flows out seawards, producing the land breeze. See also the article MONSOONS, winds produced by the same cause acting on a larger scale; that is to say, by the warming of the interior of a continent during summer and its cooling during winter.

The origin of the TRADE WINDS is to be found in the heating of the equatorial regions by the sun's rays. The air in these regions consequently ascends, and heavier air rushes in from both sides to supply its place, while the heated air which has ascended spreads out laterally, producing an upper current in the opposite direction to that beneath. Were the earth stationary, and uniformly heated all round the equator, the winds thus produced would be due north and due south. The cold air from the polar regions would flow directly towards the equator, and the heated air from the equatorial regions would flow back to the poles. But the rotation of the earth, which gives to places near the equator a greater velocity from west to east than those far from it, causes an apparent motion of the air from east to west. Hence the trade winds in the northern hemisphere blow from the north-east, and those in the southern hemisphere from the south-east. They extend generally to about 28 degrees on each side of the equator, but vary their limits according to the season of the year,

moving northwards and southwards with the sun. They are separated by an equatorial belt of calms and variable winds about 6 degrees in breadth. In the temperate zones there is a constant struggle between the polar current of air, which feeds the trade wind, and the returning equatorial current or counter-trade, the latter in general predominating, producing a south-west wind in the northern temperate zone and a north-west wind in the southern. The descent to the surface of the earth of the counter-trade, which at the commencement of its course is an upper current, must be ascribed to the cooling and consequent increase of specific gravity which it experiences in the upper regions of the atmosphere. See the articles TRADE WINDS and WINDS.

The *velocity* of the wind is usually from 2 to 12 miles an hour, the former producing a light air, the latter a stiff breeze. The highest winds on shore, in these latitudes, seldom exceed about 80 miles an hour. The *pressure* exerted on a surface directly perpendicular to the wind is proportional to the square of the velocity, and if the one be reckoned in pounds per square foot, and the other in miles per hour, the pressure is approximately equal to 1-400th of the square of the velocity. The force of the wind is measured by instruments called ANEMOMETERS, which are described under that heading.

The *hurricanes* of the tropics, which blow with a violence unknown in temperate regions, belong to the class of cyclones; and in those regions where they are most frequent, they have regular tracks along which they always move, subject to comparatively small deviations. Their diameters are usually from 100 to 300 miles, and the motion of the centre is from 2 to 40 miles an hour. The consideration of the movement of the wind in *cyclones* and *anti-cyclones* occurs in the section below on weather telegraphy.

*Rain* occurs whenever the temperature of a mass of air is lower than its dew-point. The rain will of course be heaviest when the dew-point is high and the temperature low; in other words, when a mass of air heavily laden with moisture is cooled to a very low degree. These conditions are most completely fulfilled in mountainous districts near the sea, where the wind, laden with moisture from the sea, becomes chilled by the cold mountain tops. In the Andes of Patagonia 13 feet of rain have been observed to fall in forty-one days, and at Cherraponjic in the Khasyah Mountains, east of Calcutta, about 540 inches fall annually during the south-west monsoon, from May to August inclusive. The mean annual rainfall in Great Britain is about 30 inches, the wettest portion being the hill districts of Cumberland and Westmorland, and the western highlands of Scotland, and the driest being the eastern counties of England.

When the dew-point of a mass of air is below freezing point, *snow*, instead of rain, is deposited on its being cooled below this point. [See SNOW.] When snow falls either upon mountain tops of great elevation, or in high latitudes, the heat of the sun is insufficient to melt it and it remains permanently frozen, usually in the long run consolidating into *nevé* or half-ice, or into ice, and in that state flowing away as a GLACIER. The line at which snow is always to be found is called the *snow-line*, or the plane of perpetual snow. It is very irregular in its altitude above the sea-level from numerous causes, the uncertain conditions of the earth's surface, the varying heat and shapes of the contours, proximity to large oceans, &c. But though it is so irregular, a general idea of its figure may be gained from fig. 34, Plate III., in which *N R S Q* denotes the surface of the earth and *C D E F* the superior limit of the atmosphere. The curve, *A N B S*, may be supposed to represent a section of the plane of perpetual snow, attaining, except for local anomalies, its greatest elevation in equatorial regions, and touching the earth's surface near the poles. Year by year

exact determinations are made by observation, and a valuable body of statistics grows in this way. As a general rule, it is found (fig. 30) that the warm air ascending the sides of mountains from the passes at its feet raises the snow-line, while the cold of the snow-field itself depresses the line where the surface is more isolated, giving the concave curve, *A B*, instead of the convex curve due to perspective, *C D*; and a group of peaks, *A B C D E*, such as fig. 29, will show, as all mountaineers know well, a most remarkable variety of snow-line, according as it is sheltered or exposed, isolated or connected. Taking *E N* (fig. 33) as a plane from the equator to the pole, *E B* denotes the theoretical altitude of the snow-line at the equator, and *E G* the mean of the observations actually made in South America by Humboldt; *A F* gives his observations south of the equator. The curve, *B N*, is the theoretical snow-line, the ragged line, *F G H I K*, is that due to actual observation; *D* (Pyrenees) is the only place where the lines cross, *G* (Gauri River) the only place where they coincide.

*Hail* is formed very possibly of frozen rain drops. As yet but little is positively known about it. [See HAIL.] It falls irregularly, and is often very local in its action. Thus the terrific storm of 24th July, 1818, which lasted eight minutes, and strewed a thick layer of hail among the Orkneys, along the band, of about a mile wide, shaded in fig. 32, Plate III., hurting the inhabitants, killing all the small birds, fowls, geese, &c., and devastating every field in this region, left the tracts on each side untouched, and men were digging turf within a mile of it at the time, quite unconscious of the ruin that was being wrought so near them.

The identity of *electricity* with the lightning flash was first established by Franklin. It is now known that electricity is present in the atmosphere at all times, though the mode of its production must still be regarded as uncertain. It is probable that the frequent association of heavy rain with thunderstorms is due to the fact that air, when laden with globules of water, acquires the power of conducting electricity, which it does not possess in their absence. The probability of lightning seems to be in proportion to the amount of vapour and the suddenness of its condensation. In confirmation of this view, it may be remarked that heavy rain, even when unaccompanied by lightning or thunder, is always accompanied by the manifestation of atmospheric electricity of unusual strength. See the articles ATMOSPHERE and LIGHTNING.

*Meteorological Committee.*—The late Admiral Fitzroy was the first to organize a regular system of storm-warnings based on observations of the weather. At his decease in 1865 the meteorological department of the Board of Trade was abolished; and in lieu of it the Admiralty agreed to place an annual sum of £10,000 in the hands of the Royal Society, who appointed eight or ten of its members to form a meteorological committee. An annual report is published, and is usually the most valuable contribution to meteorology for the year. The committee divides its task into three parts—Ocean Meteorology, Land Meteorology, and Weather Telegraphy.

In the prosecution of Ocean Meteorology, the committee supplies on loan to captains of ships a set of instruments which have been properly verified at Kew Observatory; they comprise a marine barometer, thermometers, and hydrometers, with occasionally an azimuth compass, all to be returned when the voyage is over for comparison with standards. The conditions of the loan are, that careful observations shall be made with the instruments, the results entered in a tabulated register, and the register transmitted to the office on return. Many captains of the royal navy are also supplied with instruments, and although reports cannot be demanded in this case, as a matter of fact reports of especial utility and value are often received from officers of the royal navy. In this way there are every year nearly 100 British merchant-ships, voyaging in

n' most every ocean, making and recording daily observations with the official instruments. Presents of charts are made to captains who send duly-prepared registers of observations; while from the mass of information thus gradually accumulated the committee prepares charts on a large scale of such portions of the ocean as exhibit meteorological peculiarities. About 250 registers are received annually at the central office from all parts of the world, and then computers and transcribers are employed in reducing these authentic records of observations to a form suitable for future use, with the fairly-grounded hope that we shall thereby add every year to our really useful weather-lore of the various oceans and seas. The number of meteorological instruments under the scientific care of the committee, including those belonging to the Admiralty, amounts to about 6000.

*Weather Telegraphy.*—Telegraphic weather information is perhaps one of the most interesting of the committee's labours. Numerous agencies are maintained in various parts of the United Kingdom charged with the duty of taking daily observations of the weather, and of forwarding tabulated registers of results to London. These agencies are supplemented by the voluntary aid of about fifty private gentlemen who make regular observations with instruments supplied by the committee. Several self-recording observatories are maintained, from which issue self-recorded diagrams of the results furnished by the instruments. From all these stations weather telegrams are received daily, and from some twice a day. Foreign governments are supplied with telegrams in which they may be interested, and transmit telegrams in return. The committee is thus made aware daily, and in several instances twice per day, of the state of the weather along the whole European coast, from Christiania in Norway to Coruña in Spain. Immediate publicity, and to the utmost extent, is given to the intelligence received; a wind chart for the day is supplied to the *Shipping Gazette*, while the daily weather report is sent gratuitously to a large number of newspapers, about fifty seaports, to the public and private observatories in the United Kingdom, to Lloyd's, to scientific societies, to government offices, and various institutions and official establishments in foreign parts. The *Times*, in April, 1875, commenced publishing daily, from information thus supplied, a very intelligible chart of the weather all round the British islands and neighbouring continental coasts. In 1876 several other daily papers followed the example of the leading journal; and in 1879 they commenced the practice of indicating every morning the probable weather during the next twenty-four hours in various parts of the United Kingdom, according to the daily forecasts of the meteorological committee. Several French newspapers have also adopted the issue of weather charts, on an even more elaborate scale than those of this side of the Channel. With all the charts the main features are that at a glance the weather and state of the thermometer may be seen for a very considerable area—say from Norway to Spain and the Mediterranean, and from the Atlantic, west of Ireland, to Denmark and Holland. The direction and relative force of the wind is also shown, the state of the sea, whether rough or calm, &c., and the rise or fall of the barometer. The publication of these charts has tended very largely to popularize accurate meteorological knowledge, and they are now regarded as among the most interesting and important items of the daily news. Some of these forecasts, as may be expected in the present state of meteorological science, prove incorrect; but a striking evidence of their worth is afforded by the Meteorological Reports, which show that considerably more than 80 per cent. of the forecasts are justified, being a remarkable advance upon the achievements of former times.

Storm-signalling apparatus is supplied to about 130 stations on the coasts of the United Kingdom, and these

are discs, &c., so coloured as to symbolize different messages or warnings. Should the collective information gathered appear to warrant such a course, the committee's central office sends out intelligence of storms probably approaching, chiefly to such stations as are most likely to be affected—sometimes on the east coast, sometimes on the west, and so on. All such information is also sent to Lloyd's, and is there posted up for the benefit of shipowners, captains, underwriters, or ship-insurers. The uninitiated cannot interpret storm signals; but port authorities and sailors generally know that a cone hoisted with the point upwards denotes an approaching wind veering round from the N.W. by N. to S.E.; with the point downwards, a wind veering S.E. by S. to N.W.; while a drum, as well as a cone, is considered to denote a very heavy gale approaching from the direction indicated by the cone. Although it is true that every year brings an ugly list of storms which from one cause or another are not foreseen, it is nevertheless the fact that out of the large number of warnings (often upwards of 400) annually issued from the meteorological office, more than three-fourths are amply justified by subsequent gales or strong winds.

Owing to its geographical position, England is able to issue to Holland and Germany warnings of almost all the gales which visit their coasts, and to receive in its turn valuable warnings from the meteorological division of the United States Signal Service, established in 1870 for the purpose of studying practical meteorology after the same methods as our own more complete body. The signal service has over 800 meteorological stations, and in this particular has the advantage of ourselves, even when the larger area to be covered is taken into consideration. Though storms travel across the Atlantic for long distances, sometimes even the whole way from America (as is abundantly proved by the examination of steamers' logs), we are never able to speak with sufficient certainty of any storm as to whether it will travel right across, and if it does, how quickly it will come, and whether it will exhibit the same violence, or even general character, in Europe as it possessed at the other side of the Atlantic.

The theory of predictions rests mainly upon the accumulating evidence as to *cyclones* or rotatory storms. In these storms the wind blows round the circumference of a circle, or perhaps, in greater strictness, in a spiral direction, winding in nearer to the centre at every revolution; the centre, however, not being stationary, but travelling with considerable rapidity. In the southern hemisphere these storms always revolve in the same direction as the hands of a watch lying with its face upwards; while in the northern hemisphere they always revolve in the opposite direction. The centre is always characterized by a very low barometer, and the cyclones always travel eastwards (in consequence of the rotation of the earth). When such a rotatory wind-storm has an area of high pressure in the centre the spiral course of the wind is outwards from the centre and reversed in direction, and the storm is called an *anti-cyclone*, but the latter kind is much less frequent than the former, and is very frequently stationary till it breaks up. If an observer stands with his back to the wind in the northern hemisphere the barometer will be lower on his left hand than on his right (and the reverse in the southern hemisphere); and conversely if a lower *isobar* (or line of equal barometric readings) be regarded as being on the left hand in a weather chart of the northern hemisphere, and a higher one on the right, the wind will be blowing from behind. It is not difficult therefore to predict the wind a few hours beforehand with some degree of certainty if sufficient observations be taken at the moment of prediction. Anti-cyclones generally give bright and always dry weather. Cyclones yield us rain and snow, or squally and overcast skies.

The appearance of a weather chart in the various states

of cyclone and anti-cyclone and a combination of the two is shown in Plate IV. accompanying this article. The plan on which they are constructed is so clear as to need no further explanation. See also the article **WEATHER** for a consideration of popular weather signs and of other departments of this subject.

**METER** (Gr. *metron*, a measure), any appliance for measuring, more particularly for fluid content, whether of liquids or gases, such as the quantity of gas passing into a house for consumption, as described in the article **GAS MEASUREMENT**. Water is measured in the same way, and the practice of supplying water by meter and charging only for the amount used is one that is rapidly extending.

**METHYGLIN**, a spiced variety of **MEAD**, or honey-wine. It is a Welsh word made up of *medd*, mead, and *llyn*, liquor.

**METHODISM**. Under this general designation may be included the history of all those religious organizations which owe their existence, directly or indirectly, to the labours of John and Charles Wesley and their coadjutors, during the eighteenth century.

The origin of this movement is usually traced to the year 1729, when a number of pious young men, students at Oxford, established a weekly meeting for the study of the Greek Testament, devotional exercises, and mutual assistance in the more active duties of the Christian life. The leading spirits of this little band were the brothers John and Charles Wesley, and the influence of the former in establishing rules for fasting, private prayer, the visitation of the sick, the poor, and of prisoners, caused the society to be nicknamed first "the Holy Club" and afterwards "the Methodists." No regular organization was formed by this little society, and its members afterwards diverged widely in their lives and public work, but the term "Methodist" clung to the Wesleys and afterwards became transferred to the societies they established. As the lives of the Wesleys will be described in the articles **WESLEY**, **JOHN** and **CHARLES**, it is only necessary to mention here that in 1738 John Wesley, under the influence of the Moravian Peter Böhler, was led to regard himself as being an "unconverted" person, and on 24th March, 1738, he passed through a period of spiritual emotion described with much simplicity in his Journal, to which he ever afterwards referred as his "conversion." Convinced that such an experience, to be obtained by repentance and faith, and to be witnessed by an inward assurance of the Holy Spirit, was of prime necessity for the commencement of the Christian life, and that this doctrine had been misunderstood or overlooked in the ordinary teaching of the church, he began earnestly to preach the necessity of conversion, and soon gathered round him a number of persons who looked up to him for guidance and instruction. In 1739 he separated himself from the Moravians, who had become somewhat antinomian in doctrine, and established a separate religious society which met at an old building called the Foundry in Moorfields, the place where the celebrated City Road Chapel now stands. All movements designed to effect a reformation in religion have to encounter hostility of a varied kind at the outset, and Methodism was no exception to this rule. Disliking his somewhat irregular proceedings, many of the regular clergymen of the Church of England declined to lend Wesley their pulpits, and so in 1739 he was led to follow the example of his friend Whitfield and take to preaching in the open air. As the number of his followers increased he formed them into little "societies" for mutual edification, and in 1743 he published a set of "Rules" for their guidance. By these rules the existence of the "class leaders" and "stewards" was recognized and regulated, and provision was made for the admission of members and the dealing with their contributions. From this point the growth of the Methodist Society was continuous and rapid throughout the whole of the life of Wesley,

and its organization was altered and amended from time to time as circumstances required. In 1741 Wesley had appointed some lay preachers to assist in the work of evangelization, and in 1744 he commenced the practice of holding an annual conference with his helpers for the management of the affairs of the society. For the greater part of his life Wesley laboured strenuously to keep his society within the Church of England, and it was not until 1784 that it was established as a legally corporate body by a Deed of Declaration executed by himself and enrolled in the Court of Chancery. By this deed the control of the society was vested in one hundred itinerant preachers named by Wesley, and power was given to the "legal hundred" continually from the first to fill up vacancies in their own number. Thus a distinct religious organization was formed capable of working by itself, and which included among its members some who were professed dissenters, although the great majority were members of the Church of England. The "high church" principles with which Wesley started gradually disappeared during his career; as early as 1746 he became convinced that the office of bishop in the primitive church was one with that of presbyter, and that the doctrine of "uninterrupted succession was a fable." In harmony with this change of view, he took upon himself in 1784 to ordain Dr. Coke, a presbyter of the Church of England, to be bishop of the Methodist societies in America, and in the following year he ordained some ministers for Scotland. In 1788 he ordained some ministers for the work in England, so that at the time of his death in 1791 the Methodist ministers were made up of presbyters of the Church of England, preachers ordained by Wesley to administer the sacraments, and a larger number of preachers who, though authorized to preach, yet did not administer the sacraments. The whole of Great Britain had been marked out into "circuits," or districts within which the preachers travelled from place to place to meet the members of the societies, now numbering over 57,000 persons, the number of the preachers being 227. Ireland had sixty-seven preachers and over 14,000 members, and there were also over 48,000 members in the Methodist society of the United States. With his commanding temperament Wesley had been the supreme authority in the society up to his death, but after that event some discussion arose in reference to the administration of the sacrament by the preachers, which was quieted after some years of discussion by a "plan of pacification" which left the matter to be decided by a majority of the trustees and officials of each chapel. In 1797 the principal rules of the society in reference both to ministers and laity were collected under the title of the "Large Minutes," and this compendium is still accepted by every Wesleyan minister on his ordination. At the beginning of the present century there were over 100,000 members in the society in Great Britain, and notwithstanding a few dissensions it continued to increase in extent and influence during the next fifty years, when it was weakened by an agitation and secession by which, between 1850 and 1855, not less than 100,000 members were lost by the old society. It began to recover itself in 1856, and it has made peaceful progress ever since. At the present day the affairs of the society are, in the first instance, controlled by an annual Conference nominally composed of 240 ministers and 240 laymen, which meets in one of the large towns about the end of July in each year. The conference is the supreme court of appeal in all matters relating to the general working of the society, and in addition to its duties in relation to the appointment and oversight of the ministers, it discusses and settles the business of all the funds and the general administrative departments of the body.

Next in importance are the district meetings, in which the preachers meet as members of a local committee of the Conference during the time it is not sitting. In the dis-

trict meetings, as in the Conference, the purely pastoral work is managed by the ministers alone, but they are assisted in all secular and financial business by certain of the lay officials of the district, who deliberate and vote on equal terms with themselves. There are about thirty-five districts in England and Scotland, each of which is divided into a varying number of circuits, the average number for each district being about eighteen. In the provinces a circuit generally includes a town and the adjacent villages within a circle of 10 or 12 miles, but the large towns and the metropolis include several circuits within themselves. To each circuit a number of ministers are appointed, one of whom is styled the superintendent, and these are generally assisted in the work of preaching by a number of lay or local preachers, who are authorized to preach, but not to baptize or administer the Lord's Supper. The financial affairs of the circuits are conducted by stewards; and the stewards, class leaders, trustees, and local preachers, with the ministers, form the quarterly meeting—a powerful body, which exercises an oversight over both the spiritual and financial affairs of the circuit. It is by the quarterly meeting that the ministers are invited (subject to the approval of Conference), and it is by this meeting that most of the circuit funds are administered. The members of the society are grouped together in little bands of from ten to thirty, which are called classes, and placed under the care of a class leader, and these are expected to meet once a week for devotional exercises and religious conversation. Each member, if able, is expected to pay a minimum subscription of a penny a week and a shilling a quarter, and every quarter the classes are visited by the minister, who personally converses with each member, to whom he gives a ticket of membership. Each minister is appointed to a circuit for one year, and he may be invited to stay for two more, but no minister may stay more than three years in a circuit. The principal statistics of the denomination at the Conference of 1887 were—

	Members.	On Trial.	Ministers.	On Trial.	Super-numerary Ministers.	Sunday Scholars.
Great Britain, . . .	412,208	31,470	1,538	90	390	595,532
Ireland, . . . . .	24,983	770	171	24	45	
Foreign Missions	31,320	4,087	221	113	7	

With respect to doctrine, the system of Methodism may be described as one of evangelical Arminianism. No doctrinal test is imposed upon members, who are merely required by the rules to be persons "who desire to flee from the wrath to come;" but the local preachers and ministers are required to subscribe to the doctrines set forth in "Wesley's Sermons" and his "Notes on the New Testament." There are also two catechisms published under the sanction of the Conference, which contain a short compendium of Methodist doctrines. After the belief in the Trinity and the Incarnation, the points chiefly insisted on are original sin, general redemption through the atonement, repentance, justification by faith, the necessity of holiness, and the possibility of attaining to a state of entire sanctification. So far as the official standards are concerned Methodist doctrine represents the moderate Protestantism of the previous century, and the subsequent developments of biblical criticism and of the science of theology have obtained little or no recognition. In everything relating to doctrine a strong conservatism has prevailed among the leaders of the denomination, but there are not wanting signs that the advent of a younger generation to power will be marked by a spirit of greater liberty than has hitherto been known in the Methodist body.

Of the many offshoots from the original body the most important are—

1. *The Methodist New Connexion*, which was formed

in 1797 by the Rev. Alexander Kilham, a minister who had been expelled from the parent body for publishing injurious charges against his brethren. The following year he died, but the little society he founded survived him, and it now reckons about 29,000 members.

2. *The Primitive Methodists*, who sprang up in Staffordshire in 1810, under the leadership of Hugh Bourne and William Clowes, two energetic local preachers who declined to obey the Conference rule prohibiting camp meetings. The Primitive Methodists have always been an enthusiastic, hard-working denomination, and they are the most numerous of all the bodies which have separated from the old Wesleyan connexion. They number about 1200 ministers and about 190,000 members.

3. *The Bible Christians* or *Bryanites*, founded by a Cornish local preacher named O'Bryan. They are found chiefly in the west of England, and they closely resemble the Primitive Methodists in their modes of working. They number about 22,000 members.

4. *The United Methodist Free Churches*, which are an amalgamation of three different secessions—the Protestant Methodists, formed in 1828; the Wesleyan Methodist Association, which sprang out of a controversy in 1834 concerning the training of ministers; and the Wesleyan Methodist Reformers, who seceded in 1850 during the great agitation in the Wesleyan society previously referred to. At the present time they have about 400 ministers and about 74,000 members.

5. *The Wesleyan Reform Union*, a very small body representing some of the seceders of 1850 who refused to amalgamate with the United Methodist Free Churches.

6. *The Welsh Calvinistic Methodists* represent an entirely independent organization altogether, and one that takes precedence in point of time to the Wesleyan Society itself. It arose out of the labours of Howell Harris of Treveera, in the county of Brecon, a gentleman of strong religious convictions, who, although a layman, began to preach and conduct revival services in 1735. About the same time a similar work was commenced, quite independently, by Daniel Rowlands and Howell Davies in 1742. George Whitfield presided over the first association of the Welsh Calvinistic Methodists, at Waterford or Watford, in Glamorganshire. The society thus established has always remained, as it commenced, quite independent of English Methodism, and its system of church government is now a modified form of Presbyterianism. It has made much progress during recent years, and now numbers about 120,000 communicants.

For the greatest development of Methodism, however, we must turn to the United States of America, into which it was introduced by a few pious emigrants from Ireland in 1766. Two ministers were sent out from England in 1769, and after the War of Independence the society in the United States was organized as an independent church, under Dr. Coke, with the title of the American Methodist Episcopal Church. Like the society in England, its history has been marked by sundry divisions, and there are at the present time five bodies known as the Methodist Episcopal, as well as several who use the term Methodist but do not adopt the Episcopal organization. In all these the doctrines and modes of worship are very much alike, the differences relating almost entirely to matters of church government. Between them they reckon over 4,000,000 enrolled members, but this by no means represents the extent of their influence, and some careful calculations, founded upon the last census of the United States, showed that the number of adherents there could not be reckoned at less than 10,000,000. In all the British colonies Methodism is well represented, and there are important missions in many of the non-Christian countries of the world, so that it is not without good reason that the Methodists claim to be "the largest Protestant church in Christendom."

For an account of the rise of Methodism see "Wesley's Journals," Tyerman's "Life of Wesley," Dr. Geo. Smith's "History of Wesleyan Methodism," and Dr. Abel Stevens' "History of Methodism." For Wesleyan theology see "Wesley's Sermons," Watson's "Institutes," Dr. Pope's "Compendium of Theology," and the series of "Fernley Lectures." An account of its elaborate internal organization will be found in the "Connectional Economy" of Dr. Riggs.

**METHODIUS** and **CYRILLUS** (Gr. *Methodios* and *Kurillos*), two brothers, the apostles of Christianity among the Slavonians in the ninth century, and the inventors of the Slavonian alphabet, were natives of Salonica, or Thessalonica, in Greece. Methodius held a high command in the Greek army; Cyrillus was in holy orders, and keeper of the library of Santa Sophia. About the year 868 he and his brother Methodius proceeded on a religious mission to the Slavonians. They translated the Psalter, the Gospels, and many other parts of the Scriptures into Slavonic. Cyrillus returned to Rome, where he died about 871. Methodius remained and continued his labours about thirty years, and he is said to have translated all the Scriptures. None of the original manuscripts are extant.

**METHYL** is the first of the series of alcohol radicles, and bears the same relation to wood-spirit or methylic alcohol that ethyl does to ordinary or ethylic alcohol. It was first obtained by the action of potassium on cyanide of ethyl. It is a colourless gas, burning with a blue flame, and having the formula  $\text{CH}_3$ .

Methyl chloride or chloromethane ( $\text{CH}_3\text{Cl}$ ) is a colourless gas, burning with a green flame.

Methyl iodide or iodomethane ( $\text{CH}_3\text{I}$ ) is a colourless liquid, boiling at  $44^\circ \text{C}$ . ( $111^\circ \text{Fahr.}$ ), and having a specific gravity of 2.237.

Methyl bromide or bromomethane ( $\text{CH}_3\text{Br}$ ) is a colourless liquid of a garlic odour, boiling at  $13^\circ \text{C}$ . ( $55^\circ \text{Fahr.}$ ).

Methyl oxide or methylic ether ( $\text{C}_2\text{H}_6\text{O}$ ) is a gas of agreeable odour, soluble in alcohol and ether, and burning with a feeble luminous flame.

Methyl nitrate ( $\text{CH}_3\text{NO}_3$ ), sulphate ( $\text{CH}_3\text{HSO}_4$ ), borate ( $3\text{CH}_3\text{BO}_3$ ), sulphhydrate ( $\text{CH}_3\text{SH}$ ), and sulphide ( $2\text{CH}_3\text{S}$ ) are all liquids.

**METHYL ALCOHOL**,  $\text{CH}_3\text{O}$  or  $\text{CH}_3(\text{OH})$ , known also as hydrate of methyl, hydroxymethane, carbinol, or wood spirit, or naphtha, is manufactured on the large scale from the crude wood vinegar, obtained by the destructive distillation of wood in the manufacture of charcoal. It is separated by distillation. It is a colourless liquid of agreeable odour when pure. It boils at  $66^\circ \text{C}$ . ( $150^\circ \text{Fahr.}$ ), and has a specific gravity of 0.798. It mixes in all proportions with water, like ordinary alcohol, and is substituted for it in many applications. It is used in lamps for burning, and as a solvent for resins in the making of French polish and varnishes. It is much used in the preparation of methylated spirit, which is ordinary alcohol mixed with 10 per cent. of methyl alcohol, only partially purified, and retaining a nauseous flavour, to render the mixture unfit for drinking purposes. It is thus supplied free of duty and largely employed in the laboratory and in various chemical manufactures. Methyl alcohol yields by oxidation formic acid ( $\text{CH}_2\text{O}_2$ ).

**METHYLAMINE** or **METHYL-AMMONIA** is an organic base homologous with ethylamine. It is a colourless gas very like ammonia, fuming with hydrochloric acid, and very soluble in water. The formula is  $\text{CH}_5\text{N}$ . It burns with a yellow flame, thus differing from ammonia, which is not combustible. It is the most soluble of all gases; water dissolves 1150 times its volume, affording a very caustic solution. It is a strong base, forming a great number of salts, of which the most common is the hydrochlorate of methylamine or chloride of methylammonium ( $\text{CH}_5\text{NCl}$ ). It crystallizes in large deliquescent

plates, and forms double salts with gold, mercury, and platinum.

Dimethylamine ( $\text{C}_2\text{H}_7\text{N}$ ) is a liquid of strong ammoniacal odour, very soluble in water, and boiling at  $8^\circ \text{C}$ . ( $46^\circ \text{Fahr.}$ ) It is found in guano. It is also a strong base, and forms double chlorides with gold and platinum, which crystallize in beautiful, long, yellow needles.

Trimethylamine ( $\text{C}_3\text{H}_9\text{N}$ ) is an oily liquid, very alkaline, with an intensely disagreeable and persistent odour of rotten fish. It is found in considerable quantity in herring brine, also in putrefying yeast, and is a common product of decomposition. It boils at  $9^\circ \text{C}$ . ( $48^\circ \text{Fahr.}$ ) It forms a number of crystallizable salts.

Tetramethylammonium ( $\text{C}_4\text{H}_{12}\text{N}$ ). This base is not known in an isolated state. The hydrate ( $\text{C}_4\text{H}_{12}\text{NHO}$ ) is a white crystalline mass, which yields with acids a number of crystalline salts. The chloroplatinate crystallizes in beautiful orange-coloured octahedrons. There are a great number of compound methyl bases in which ethyl and amyl are combined with methyl in varying proportions, all forming crystalline salts closely resembling those of the simple methyl series.

**METHYLENE**, the first of the hydrocarbon series. It is a colourless gas, burning with a yellow flame, and having the formula  $\text{CH}_2$ .

Methylene chloride ( $\text{CH}_2\text{Cl}_2$ ) is a dense colourless ethereal liquid, having an odour of chloroform, a specific gravity of 1.332, and boiling at  $40^\circ \text{C}$ . ( $104^\circ \text{Fahr.}$ ) It has been used as an anæsthetic instead of chloroform.

Methylene bromide ( $\text{CH}_2\text{Br}_2$ ) resembles the chloride. Methylene iodide ( $\text{CH}_2\text{I}_2$ ) is a very dense liquid, having the specific gravity 3.842.

**METIOS** (Gr. *metioikos*) were what we should call the resident aliens in Greek cities, especially numerous at Athens, where foreigners always abounded. No less than 10,000 permanently established metics were enumerated in the census held by Demetrius of Phalérón (n.c. 309) at Athens. No matter what the length of residence citizenship never accrued as a right, and the power of owning houses or land was rigidly withheld; but commerce and manufactures were (at Athens) always freely open to metics. All metics paid a tax of 12 drachmai a year, and were liable to military service, &c., the same as the true citizens.

**METIS**, the Greek goddess of sagacity, daughter of Okenos and Téthys. Mêtis was the first wife of Zeus, who grew alarmed at her wonderful wisdom, and dreaded the birth of her child, lest it should be the signal for his own downfall. He therefore swallowed her. In due time Athena was born, springing from the head of Zeus himself in full panoply of armour.

**METONIC CYCLE** (Gr. *kuklos*, a circle), a discovery of the Athenian astronomers Metôn and Euktemôn, who found that 235 lunar months almost exactly equal nineteen solar years, and that therefore historical events could be marked precisely by their occurrence in such or such a year of this cycle, while the length of the cycle was great enough to afford security against confusion of any year of any cycle with the same relative year in the next. The metonic cycle is usually held to begin n.c. 432.

**METONYMY** (Gr. *metonymia*, change of name), in rhetoric and composition, a figure by which the name of an idea or thing is substituted for that of another to which it has a certain relation. Thus, the effect is sometimes substituted for the cause, substance for attribute, &c.; as, His vices disgraced his gray hairs (i.e. disgraced his age).

**METOPE**, in architecture. A metopë is the space between each triglyph and the next in the frieze of the Doric Greek order, and this was usually filled with a group of figures or an ornament. The decorations were also called metopë, as well as the space which held them.

**METRE**, a certain definite collocation of feet forming a verse or line of ancient classical poetry, each metre being governed by its own laws as to the power of variation in the normal order of the feet. The chief varieties of poetical feet are given in the article FOOT, and one of the most famous ancient metres is described under **HEXAMETER** (Greek *hex*, six, this metre having six feet in the verse).

The attempt often made to classify musical tunes by the terms of the old classical metres fails, and must fail, because music depends altogether upon the collocation of accents, that is, upon rhythm, while metre depends upon the collocation of quantities, that is, of long and short syllables. No one knows better than the musician that his accented note is frequently a short note, a case which shows at once the futility of measuring one thing by another logically distinct from it.

Modern poetry also goes by rhythms of accents, not by metre. For instance the word *monument*, which we pronounce with the stress on the first syllable, is, by the rules of prosody, an *anapest*, that is *monúment*; and seeing, which has an accented syllable followed by an unaccented one, would be by the classical rules an *iambus*, that is *sée-ing*. Notwithstanding this entire diversity of meaning metre is habitually used in our ordinary speech to express our collocation of accents, instead of the more correct word *rhythm*. We have thus our famous *heroic metre*, of ten syllables to the line, the metre of Shakespeare's plays and Milton's "*Paradise Lost*;" our *ballad metre*, of alternate eight and six (called by hymnologists *common metre*); the *long metre* and *short metre* of our churches (8888 and 6686 respectively), and the *sevens*, whose name explains itself (7777), &c. Octosyllabic metre (the long metre of our churches, and in classical *parlance* iambic tetrameter) is the favourite metre of Scott in his famous lays, "*The Lay of the Last Minstrel*," "*Marmion*," &c., of Butler in his "*Hudibras*," &c. There are also the distinctions of what we agree to call iambic verse, as

"O God, beyond that boundless sky" (iambic),

in which the accented syllables lead, and what we agree to call trochaic verse, as

"Rock of Ages, cleft for me" (trochaic),

in which the accented syllables follow. There are various sorts of anapestic verse, so called, in which the accent comes once in three syllables, and is sometimes the first, sometimes the second, sometimes the third of the three—corresponding to the dactyl, to the amphibrachys, and to the anapest respectively, if for accented and unaccented syllables we were to have long and short. Curiously enough Byron's "*Bride of Abydos*" gives in its first three lines an example of each variety of this three-syllabled metre in their succession as above enumerated.

Know ye the | land where the | cypress and | myrtle  
Are emblems | of deeds that | are done in | their clime,  
Where the rage | of the vul- | ture, the love | of the tur- | tle, &c.

Nothing can, at the same time, better show the falsity of decorating our rhythms with antique names than this fragment. The last line (reading quantity for accent) is the only one in anapestic metre of the three; but if the passage is read aloud it is found (still using the old terms of quantity improperly to describe accent) to be purely dactylic, having an accented syllable, followed by two unaccented, and to be thus arranged:—

Know ye the | land where the | cypress and | myrtle Are |  
emblems of | deeds that are | done in their | clime, Where the |  
rage of the | vulture, the | love of the | turtle, Now |  
melt into | sorrow, now | madden to | crime, &c.

Still following classical nomenclature we speak of a line containing one accent as a *monometer*, the classical term for a line of one foot, of a line of two accents as a *dimeter*, of one of three as a *trimeter*, and so on for *tetrameter*, *pentameter*, *hexameter*, &c. We find a curious specimen

of the first three, in reversed order, in Herrick's "*How to keep Lent*," all iambic measures:—

Is this | a fast | to keep | (trimeter)  
Thy lar- | der leai | (dimeter)  
And clean | (monometer)  
From fat | of meats | and sheep? |

In this nomenclature Shakespeare may be said to write usually in unrhymed iambic pentameters, as

The qua- | lity | of mer- | cy is | not strain'd: |  
It drop- | peth as | the gun- | the rain | from heav'n. |

Refer also to the articles POETRY, PROSODY, FOOT. The essential distinction between metre and rhythm (that is, between quantity and accent) cannot, however, be too earnestly insisted upon.

**METRIC SYSTEM.** See DECIMAL SYSTEM.

**METRONOME**, a mechanical appliance used by musicians for beating time, the best being a variety of the double-pendulum.

The principle of the pendulum, as a time-measurer, was early applied to music, and with good reason; for it is evident that if a composer can direct a piece of music to be played with the accents occurring so many times in a minute, he has power to fix the exact pace at which he desires his music to be performed. In fact this is the only method, other than personal tuition, of insuring the realization of the composer's time-idea. Plumb-lines, with variable lengths of string, were used as early as 1696 to indicate varied numbers of beats per second, but seeing that a pendulum to beat as slowly as sixty times a minute, or once a second, must be over 39 inches long, all these attempts (and they were many) were failures on account of their cumbersome nature.

The way out of the difficulty was found, as is generally believed, by Maelzel, the unworthy friend of Beethoven [see MAELZEL], who, in 1816, patented at Paris a double-pendulum arrangement with a graduated scale, that at once satisfied the musicians of the time, and has remained the standard time-keeper ever since. In truth, however, it was not Maelzel who made this valuable discovery. He was a fair musician, and a man of considerable inventive mechanical talent, and he had already himself constructed a pendulum with a graduated scale as a measurer of musical time which had received Beethoven's good word. But at Amsterdam, in 1815, he learned of an appliance commended by the Dutch Academy of Sciences, whereby a certain Winkel, a practical working mechanic, had brought the double-pendulum to perfection. In this instrument the pendulum has two "bobs" or weights, one fixed and below, the other movable and above, and the pendulum swings on a pivot passed through its middle. The upper part of the pendulum being moved aside, the fixed weight below draws the rod back sharply towards the perpendicular, and so, as usual with pendulums, sets it swinging; if the movable weight be down near the centre the pendulum will swing swiftly, but if it be moved to the upper end of the rod its leverage becomes great, and it impedes the action of the fixed weight so much that the return towards the perpendicular is sluggish. The pendulum can be made to differ very greatly in its rapidity of vibration by the adjustment of this upper weight, and if the upper part of the pendulum be graduated and numbered, it will be found that a range of from forty to 200 beats a minute is readily obtainable. The graduation of the scale was the only point really due to Maelzel, who saw at once the value of Winkel's double-pendulum, offered to buy it, and being refused, stole it—that is the only expression possible. He rushed to Paris, where Winkel had not secured his invention, patented it in his own name, and at once set up a manufactory which had the greatest success. From that time to this, though poor Winkel got his case investigated, and was formally decreed the inventor by the Dutch Academy, the metronome has been called Maelzel's Metronome.



Hitherto the machine was silent. It was adjusted, made to swing by the hand, and then swung silently at the pace to which it was set, with ever smaller excursions, until the first impetus was exhausted. This older silent form is still preferred by many sensitive musicians, but is difficult now to obtain. The general public desired the ear attacked as well as the eye, and accordingly Maelzel afterwards applied clockwork to the machine; this being wound up goes at the pace controlled by the pendulum, as any other clock does, and ticks at each vibration.

Recently a further advance has been made in the shape of a bell, whereon the clock strikes at each second, third, fourth, or sixth beat as preferred, marking in this manner the first of the bar for all the principal varieties of time.

Teachers who aim at mechanical dexterity and fligid accuracy make their pupils play whole pieces by the metronome, whose tick-tick forms a hideous accompaniment throughout. But that is to use a worthy tool badly. The time once fixed by the metronome, the pupil, if possessed of the ordinary capacity for time, should use it afterwards sparingly; in fact it should merely serve as a check in dangerous passages.

Metronome marks comprise a musical note, describing the musical value of the beat, and a figure denoting the number of such beats a minute. Thus  $M.M. \text{♩} = 100$ , a rather quick *tempo*, means that the movable weight is to be placed at 100 on the scale, and the metronome will then beat 100 times in a minute, each of these beats being read as a minim. Similarly  $M.M. \text{♩} = 100$ , would make the same adjustment serve to indicate a slow *tempo*, just half the pace of the former, for here only 100 crotchets a minute occur instead of 100 minims.

**METROPOLITAN** (Gr. *mētēr* and *polis*, the mother city), a term applied to the archbishop or first ecclesiastical dignitary of a province or country, who is supposed to reside in the *metropolis*, or chief city, whence the appellation. The establishment of metropolitans took place at the end of the third century, and was confirmed by the Council of Nice. The metropolitan had the general direction of ecclesiastical affairs of the province. In England the metropolitans of the Established Church are the archbishops of Canterbury and York.

**METSU', GABRIEL**, a distinguished artist of the earlier Dutch school, who modelled himself, though not slavishly, upon Gerard Dou and Tenborch (or Terburg), was born in 1630 and died about 1670. The beautiful pictures of the "Duet" and the "Music Lesson," and some others in the National Gallery, well represent the master. The "Lace Maker" (at Dresden) is considered his *chef-d'œuvre*.

**METTERNICH, CLEMENS WENZEL NEPO-MUK LOTHAR, PRINCE**, Duke of Portella, a celebrated Austrian statesman, was born at Coblenz, 15th May, 1773. His father, Franz Georg Karl, was an Austrian nobleman holding high office in the Austrian court, and the young Metternich entered public life under the most favourable auspices. In 1801 he was appointed Austrian ambassador at Dresden, and in 1803 he was promoted to Berlin. After the third coalition war he was made in 1806 ambassador at Paris, where he remained until the war of 1809, when he returned to Vienna, and in the crisis of Austrian affairs after the defeat of Wagram he was made prime minister. To procure breathing time for the rescue of Austria, politically and financially, he negotiated the marriage of the Archduchess Maria Louisa with Napoleon, and when the latter, after the disasters of his Russian campaign, had to encounter the united forces of Russia and Prussia, Metternich offered him the most favourable terms of peace, and only on their rejection joined the coalition against him. After the battle of Leipzig Metternich was created a prince, and after the first fall of Napoleon he secured for Vienna the honour of being the scene of a

congress which was to organize a European peace. After the final fall of Napoleon Metternich became for a time the foremost statesman of Europe, and he exerted his utmost influence in favour of a policy of repression. At his instance the constitution and general assembly that had been promised the Prussians by King Frederick William were withheld, the severest measures were adopted to destroy the liberty of the press and to control the teaching of the universities, and Austrian troops were sent to crush the risings in Naples and Piedmont. By his policy he secured a temporary appearance of order, but it was at the price of future convulsions; and after remaining in power until 1848 the revolution of that year drove him from office for ever. One of the first acts of the exasperated people was to sack the palace of the absolutist premier, and Metternich fled for safety to England. In the autumn of 1851 he returned to Vienna, but was not asked to take any part in the conduct of public affairs, and he remained in retirement until his death on 5th June, 1859.

Metternich possessed high abilities as a diplomatist, and during a great portion of his career he was certainly the most influential statesman in Europe. He served the Austrian government with unswerving fidelity, and in his private life he was kind and affectionate. But he had been trained from the first to hate all innovation, and as he regarded himself as the guardian of Europe against the influence of liberal ideas, he was led to prevent the union of Germany, to keep Italy disunited and weak, to oppose the independence of Greece, and to repress every legitimate aspiration towards liberty until the forces he suppressed found vent in revolution. His "Memoirs" show that he was excessively conceited and egotistical, and the saying, rightly or wrongly, attributed to him—"Après moi le déluge"—expresses not inaptly his own idea of his position as the upholder of the peace and order of Europe.

**METZ**, now the capital of German Lorraine, is the ancient *Dinodurum Mediomatricorum* and the *Mettis* of the fifth century, and the capital of the kingdom of Austrasia or Metz in the sixth century. It was made a free imperial city in 985. It was besieged by Charles VII. of France for seven months in 1444, and was ransomed for 100,000 florins; was captured by Henry II. on 10th April, 1552; and successfully defended by the Duke of Guise against the Emperor Charles V. with an army of 100,000 men, from 31st October, 1552, to 15th January, 1558. After being fifty-six days before the town, the emperor at last reluctantly consented to retire, having lost 30,000 men. The French, when they broke out of Metz, found the imperial camp full of the dead and dying. The city was ceded to France by the peace of Westphalia, 24th October, 1648, and was very strongly fortified by Vauban and Belleisle. On the outbreak of the war between France and Germany in 1870, the Emperor Napoleon III. arrived at Metz (28th July), and assumed the chief command of the army of the Rhine. After the French disasters at Weissenburg, Woerth, and Forbach, nearly the whole of the French army was concentrated here, and hemmed in by the Germans. The bloody battles of Courcelles, Vionville, and GRAVELLOTTE ensued, and the French being ultimately defeated and driven within the shelter of the fortress, the city was subjected to a regular siege, which lasted seventy days. It surrendered on 27th October, 1870, and at the conclusion of peace in the following year it was finally ceded to Germany. The defeated army consisted of 173,000 men, including the Imperial Guard and about 6000 officers, sixty-six generals, and three marshals. The Germans also became possessed of 400 pieces of artillery, 100 mitrailleuses, and fifty-three eagles or standards. Marshal Bazaine, who commanded, was tried by court-martial in 1873 and sentenced to death. This, however, was commuted to imprisonment for twenty years in a fortress, from which he contrived to escape in August, 1874.



Metz is built on the Moselle, at the point where that river is joined by the Seille, 190 miles east by north from Paris, and had in 1881 a population of 51,131. Its cession to Germany caused a large emigration of French families, and for a time the population was very much reduced. Metz is washed on the west by the Moselle, which makes a bend and traverses the town; the Seille enters the city on the south, dividing into two branches, one of which flows between the ramparts, while the other runs through the town and drives several mills: these rivers are crossed by several bridges. Metz is entered by nine gates furnished with drawbridges, and is girt by a system of fortifications which in 1870 were so strong that, had it been properly provisioned, it could have held out indefinitely. Since the German occupation the defences have been completed and enormously strengthened, and it is now the strongest inland fortress in the world. The new works consist chiefly of detached forts placed about 6000 yards from the city, at intervals of 3500 yards, with intervening smaller batteries. All the forts communicate with each other and with the town by railway. The store-houses will now hold sufficient provisions for 40,000 men for several years, and so extended are the fortifications that it is estimated that it would require an army of 400,000 to besiege it.

Metz is in general a well-built town; the houses are mostly of cut stone. The esplanade is one of the finest promenades in Europe, formed by numerous avenues of trees, and commanding a fine view over the rich valley of the Moselle. Among the many remarkable structures of Metz must be mentioned the cathedral, founded in 1014 but not finished till 1546, and thoroughly restored by its new possessors during 1871-75. The elegance, delicacy, and boldness of this structure have been always much admired. Of its lightness some idea may be formed from the circumstance that the total area of its windows, many of them of the best age of glass-painting, amounts to no less than 4869 square yards. Its spire is 397 feet high. The cathedral was seriously injured by fire during the illuminations in honour of the visit of the Emperor of Germany in 1877, but has since been repaired. Other noteworthy buildings are the churches of Notre Dame de la Ronde (1180) and St. Vincent; the military hospital, a large building contiguous to the barracks and close to the Moselle, capable of receiving 1500 patients; and the palace of justice, in which the courts are held and the public library of 35,000 volumes is kept. Next to these, the town-house, the mint, the churches of St. Martin, St. Nicolas, and Sainte Segolène, and a large Protestant church, as well as another library of 10,000 volumes of select works, and rich in manuscripts by Vauban, Monge, and other writers on fortification and the art of war, are the most notable objects in the town. Metz possesses an artillery and engineering school, a royal college, and several literary and scientific societies.

Among the industrial products of the town are broad-cloth, flannel and other woollen stuffs, hosiery, plush, smallwares, muslin embroidery, room-paper, glue, chicory coffee, cotton twist, excellent beer, nails, tiles, and leather. There is a fair trade in these articles, and in wine, brandy, confectionery, groceries, furniture, hides, iron, &c.

**MEUM**, a genus of plants belonging to the order Umbelliferae. The name is from the Greek *meion*, supposed to be derived from *meion*, very small, from the extreme fineness and delicacy of the leaves of these plants. *Meum athamanticum* (common bald-money), is a highly aromatic plant, with numerous white and yellow flowers. It is a native of Western Europe, in dry mountain pastures, and is found in the north of England and the mountains of Scotland. The root-stocks, seeds, and every part of the plant are aromatic, and are used in the countries where it grows as stomachics and carminatives. A strong infusion of the herb gives cheese the taste of the Swiss schabzieger, which,

however, is actually produced by the use of the common melilot. It is uncertain from what source the word "bald" in "bald-money" is derived, but the most likely conjecture is that it refers to the Apollo of the north—Baldur.

**MEURTHE-ET-MOSELLE**, a department in France, consisting of the remaining portions of the old departments, deriving their names from the rivers Meurthe and Moselle, ceded to Germany in 1871. It is bounded on the E. by Alsace-Lorraine; on the N. by Belgium and Luxemburg; on the W. by the department of the Meuse, and on the S. by that of the Vosges. The area is 2020 square miles, and in 1886 the population was 431,693.

*General Character.*—The department is remarkable for the beauty of its scenery, the fertility of its soil, and the variety of its productions. The principal chain of the Vosges Mountains runs along the eastern boundary, reaching in one of its summits to the height of 1148 feet above the plain. The rest of the department presents a pleasing variety of hills, dales, and well-watered valleys—the hills, which branch off from the Vosges, nowhere exceeding 650 feet in height, and nearly all running in a north-western direction. The hill slopes, and a considerable portion of the plains, are covered with dense forests.

*Hydrography.*—The Meurthe rises in the east of the department of the Vosges, and running first north and then north-west, past St. Dié and Raon l'Étape, enters the department below this last town; here it flows through a fine valley, fertilized by the deposits of its frequent inundations, in a general north-west direction, past Lunéville, Rosières, and Nancy, where it becomes navigable, and a little below which it falls into the Moselle, on the right bank, after a course of 70 miles. The west of the department is drained by the MOSELLE, which here receives the Madon on its left bank. The Seille, which springs from one of the lakes in the east of the department, flows through a very fertile valley, first west and then north, falling into the Moselle at Metz, in the department of Moselle. The Sarre rises on the western side of the main chain of the Vosges Mountains, in the south-east of the department, and flows generally north as far as Sarreguemines, in the department of Moselle. Below this town it enters the Prussian Rhein-Provinz, through which it runs north-west to its junction with the Moselle a few miles above Tièves. The Paris-Strasbourg Railway crosses the department, passing through Nancy, whence a branch runs north to Metz. The Canal des Salines, which runs from Deuze to Sarralbe in Moselle, unites the Seille with the Sarre.

*Products, &c.*—The vine is generally cultivated, and a large quantity of wine, as well as wheat and timber, is exported. Rape is extensively grown, both for green food and for making oil. Hay is abundantly produced along all the river valleys. Potatoes, herbs of all kinds, and fruits are extensively cultivated. Horses and cows are small; the latter are, however, of a tolerable breed and good milkers. Hogs are numerous; pork is a staple article of the food of the people. The forests still contain the deer, the roebuck, and the wild boar; foxes and weasels are common.

Iron ore is found, but too poor to be worth working. Building stone, marble, alabaster, and limestone are quarried; lithographic stone, red and gray granite, grindstone grit, glass sand, potter's clay, &c., are found. There are vast deposits of turf, and an immense bank of rock salt, whence issue valuable salt springs.

The chief manufactures carried on in the department are—glass, crystal, porcelain, paper, linen, woollen, and cotton fabrics. A great variety of other articles are made, but in smaller quantities. The inhabitants are a mingled German and French race. The department of Meurthe was formerly divided into five arrondissements—Nancy, Lunéville, Toul, Château-Salins, and Sarrebourg. The result of the Franco-German War of 1870-71 was, how-

ever, to deprive France of the whole of the arrondissements of Château-Salins and Sarrebourg, containing over 180,000 inhabitants, and the fortresses of Sarrebourg and Phalsbourg. The chief town is NANCY.

**MEUSE**, the ancient *Mosa* and the Dutch *Maas*, a river which rises in the plateau of Langres, in the department of Haute-Marne, and flows first in a general northern direction, and then west into the German Ocean, having drained portions of France, Belgium, and Holland. Its upper current is formed by two small streams that unite at Fort Fillières, but it is only after passing the village and the ruined castle of Meuse that it obtains its present appellation. Having traversed in a direction of north by east the eastern part of Haute-Marne, the Meuse enters the department of Vosges, where, flowing underground for 4 miles, it reappears a little south-west of Neufchâteau, not far north of which it crosses the boundary of the department of Meuse. On entering the department of Ardennes it has a very winding course, first north-west past Sedan, Mézières, Charleville, and then north by east past Fumay and the fortress of Givet, just below which it enters the kingdom of Belgium. Here it traverses the province of Namur, in the direction of north by west as far as the town of Namur, whence it flows north-east to Liège, and again turning north by east it enters the Dutch province of Limburg, which it traverses in the same direction to a few miles below Veuloo, where it turns nearly north-west as far as Grave. From the neighbourhood of Grave it flows west, and separates North Brabant from Guelderland and Holland. Below Gorcum it divides into two arms. Of these the northern one, flowing through the province of Holland, takes the name of Merwe, as far as Dort, where it subdivides into two branches, the northern one called the Maas, the southern one the Old Maas, which inclose between them the island of Ysselmonde; these branches, uniting on the eastern side of the isle of Rosenburg, form a wide current, which enters the North Sea to the north-west of the island of Voorne. The southern arm, having passed through the Biesbosch, takes the name of Hollands-diep as far as Willenstadij, below which it also subdivides into two branches; one of these, first called Haring-vliet, and more to the westward Flakkee, enters the North Sea by a wide estuary between the islands of Voorne and Over-Flakkee; the other flows into the North Sea between the islands of Over-Flakkee and Schouwen, having first sent part of its waters to the eastward of Schouwen Island into the Ooster Scheldt. The whole course of the Meuse is 680 miles. It is navigable from Verdun to its mouth, a distance of 460 miles; 140 of these are in France. The principal feeders in France are—the Mouzon, the Vair, the Chiens, the Semoy, on the right bank, and the Bar on the left; in Belgium, the Lesse, the Ourthe, on the right, and the Sambre on the left bank; in Holland, the Roer, the Niers, the Linge, the three branches of the Rhine known as the Waal, the Leck, and the Yssel, on the right bank, the Dommel and the Merk on the left. Many of these rivers are navigable; those that are not so are available for floating timber. The Meuse communicates with the basins of the Rhine, the Seine, and the Scheldt, by means of canals. The Meuse, like the Rhine, is a continual source of danger to the inhabitants of the low country near its mouth, and it is constantly filling its bed and rising higher and higher and ever threatening to overwhelm the land. In consequence of this a scheme has received the sanction of the Dutch legislature for diverting the Meuse, before its junction with the Waal, into a new channel.

**MEUSE**, a department in France, formed out of a part of the old province of Lorraine, is bounded north-west and north by the department of Ardennes and Belgium, east by the departments of Moselle and Meurthe, south by those of Vosges and Haute-Marne, and west by those of

Marne and Ardennes. Its greatest length from north to south is 80 miles, and its average width is 33 miles. The area is 2405 square miles, and the population in 1886 was 291,971.

**Surface and Soil.**—The surface of this department presents great variety. It is traversed from south to north by a range of low hills, called the mountains of Argonne, which form the watershed between the Meuse and the Seine. The lower slopes yield good white and red wines. The soil of the plains is somewhat unproductive; but the river valleys, especially those of the Meuse and the Ornain, are fertile. The climate is cold and humid, but healthy.

**Rivers, &c.**—The chief river is the MEUSE. The west and south-west of the department are drained by the AISNE and its feeder the Aire; and by the Ornain and the Saulx, which unite their waters, and, swelled by the Cher, flow into the Marne a little below Vitry-sur-Marne. The Paris-Strasbourg Railway traverses the department.

**Products, &c.**—Hemp, flax, and oleaginous seeds are cultivated. Cattle and sheep are extensively reared; swine and goats are numerous; horses are small. Gooseberries and strawberries are grown in very large quantities in the neighbourhood of Bar-le-Duc and Ligny, whence they are largely exported in the preserved state. Gruyère and cream cheese are made in the arrondissement of Commercy. Several iron mines are worked; good building stone, mail, potter's clay, and slates are found. Fossils of great variety, and some of large dimensions, are met with. The chief manufactures are—cotton cloth and twist, hosiery, oil, glass, paper, pottery, beer, leather, inferior brandy, &c. Iron is worked. The department is divided into the four arrondissements of Bar-le-Duc, Commercy, Montmédy, and Verdun. The chief town is BAR-LE-DUC.

**MEW**, or rather *Sea-mew*, is a name given in this country to some of the GULLS (*Larus*).

*Mew*, in falconry, signifies the place where hawks are kept.

**MEXICO**, a large country of North America, lying between 15° and 32° N. lat., and 86° and 117° W. lon., borders northwards on the United States; eastwards on the Gulf of Mexico, the Caribbean Sea, and British Honduras; southwards on the republic of Guatemala and the Pacific Ocean, which also waters its western seaboard. The frontier line between Honduras and Guatemala is not yet accurately defined, the land through which it passes being still but partly explored. In shape presenting the appearance of a cornucopia with its mouth turned northwards, Mexico forms a vast isthmus, constantly narrowing from north-west to south-east, and throwing off a considerable peninsula to the south-east. The extreme length, north-west and south-east, from the extremity of the state of Chiapas to the northern limit of Lower California, is upwards of 2000 miles; the extreme breadth is about 1100 miles; its coasts extend about 1600 miles in the Gulf of Mexico and the Caribbean Sea, and upwards of 4200 miles on the Pacific Ocean and in the Gulf of California; and it contains an area of about 750,000 square miles.

**Surface, &c.**—The country consists chiefly of an elevated plateau. The great mountain chain of the Cordilleras, that enters it from Central America, branches off into two distinct ranges—one running to the east, and along the shores of the gulf, and the other to the west, along the coast of the Pacific, supporting between them a continuous lofty platform, which is itself intersected by numerous mountain chains, some of which attain to the height of 17,000 feet above the level of the sea. Upon this elevated table-land are situated the plains of Puebla, Mexico, Queretaro, and Michoacan, which are themselves at a height of 6000 to 8500 feet, several volcanic cones and snowy peaks rising upon them at intervals. Here there are numerous lakes, the remains of immense basins of water which formerly

existed, but they appear to be annually decreasing in size. The principal is Lake Chapala, 90 miles in length.

*Rivers.*—The principal rivers are the Nueces, Tigre, Tampico, and Alvarado, flowing eastward; and the Bolsas, Rio Grande de Santiago, Culiacan, and Yague, entering the Pacific; but all are much inferior in size to the Rio Bravo del Norte, which forms the north-eastern frontier. The rivers are unsuitable for navigation, in consequence of the numerous rapids. Mexico is on the whole badly supplied with water, and since the Spaniards have to a great extent discontinued the system of irrigation which was followed by the Aztec races with so much success, many tracts of country have become barren and unfit for human occupation. In the east springs are rare, and the rapid evaporation on a light soil, covering porous rocks, leaves the surface dry and hot, and unable to support any vegetation except the cactus and some low grasses. The western parts of the plateau, however, yield by careful irrigation rich crops of maize and wheat, but they are here and there interspersed with sterile tracts, either covered with stones or lava. In contrast with these unprofitable districts the plains are occasionally broken by depressions, descending sometimes to a depth of 1000 feet, and measuring several miles across, which are covered with a luxuriant vegetation and watered by small streams.

*Soil, Climate, and Productions.*—The great diversity of the climate has caused the division of such parts of the country as have been brought into cultivation under the three following heads:—1, The *Tierras calientes*, or hot lands, a narrow belt embracing the two respective coasts, and extending up the slopes of the mountain chains to an elevation of from 3000 to 4000 feet; 2, the *Tierras templadas*, or temperate lands, situated at an elevation of from 4000 to 8000 feet, including the whole of the vast table-land between the mountains of the Gulf and those of the Pacific slope, and containing within their limits most of the greater centres of population; 3, the *Tierras frias*, or cold lands, which comprise the mountainous districts rising above the highest level of the *Tierras templadas* to the limits of perpetual snow.

It may be observed also that the remarkable diversities of climate, arising chiefly from a configuration of surface calculated to produce such diversities within a narrow compass, scarcely admit of any very exact distinctions between the four seasons of spring, summer, autumn, and winter being generally established; the Mexicans themselves very commonly divide the twelve months into two great divisions—the rainy season, which lasts from May to October; and the dry season, which comprises the rest of the year. The rain begins on the east coast, and about the first week in May, and, advancing with the trade-wind, reaches the capital about three weeks later.

The temperate region is healthy, but in the hot zone yellow fever prevails in the summer, and in the winter north winds and hurricanes. The *Tierras frias*, tempered by cold, have a mean temperature of 67° Fahr., and are healthy. In the hot region the banana, pine-apple, orange, and vanilla are grown; the temperate zone, having a perpetual summer, produces maize, oranges, lemons, olives, and grapes; while in the colder districts wheat and barley, the agave, &c., flourish. Tobacco, sugar, cotton, coffee, cocoa, pepper, raw silk, medicinal plants, mahogany, and india-rubber are other products of Mexico. Maize is the staple article of subsistence in the central states. In some places the yield is immense, being at the rate of 250 bushels for every bushel planted. In many parts also two crops are gathered annually, and even three in some districts of the Gulf coast. The flour is made up into thin cakes, called *tortillas*, which are eaten warm, and form a very nutritious food; but being rather insipid, they are flavoured with some highly-seasoned sauce, in the composition of which *chile*, a kind of capsicum, is the principal ingredient.

Vanilla also constitutes an important production, principally in the states of Vera Cruz and Oajaca; as do also capsicums, which are consumed in very considerable quantities, especially among the lower classes of the population; but among the cultivated plants of Mexico none is so generally met with as the magney, or aloe, the fermented juice of which, called *pulqué*, is the favourite beverage of the country. The fibres of the leaf serve the same purposes as hemp.

The forests near the coast display the grandest specimens of tropical vegetation, such as mahogany, Brazil wood, palm trees, and giant ferns, Campenchy wood, iron wood, and American ebony. At a height of 3000 feet the Mexican oak predominates, but disappears at 10,000 feet, while the pine flourishes between the elevation of 6000 and 12,000 feet. Dye-woods abound in various parts—log-wood particularly being an important article of trade.

The best cultivated districts of Mexico are those which lie near the rich mines of the plains extending from Zelaya and Salamanca to Silao, Guanajuato, and Leon, the opening of a mine never failing to call tillage into existence.

Many of the flowers of Mexico have contributed to enrich the gardens of Europe, among others the well-known dahlia and several of the fuchsias. At the time of the Spanish conquest of the country a passion for flowers distinguished the natives, and it is still a characteristic of their descendants, exhibited in household life and on festive occasions. Around Jalapa grows a convolvulus, the root of which supplies the jalap of medicine, so called from the site. Several species of cactus are also cultivated, the principal being the cochineal cactus, upon which the cochineal insect subsists, and magney, already alluded to.

*Animals.*—Among the wild animals of Mexico are the grizzly bear, bison, tapir, jaguar, cougar or puma, ocelot, wolf, lynx, skunk, and wild cat, besides monkeys, alligators, rattlesnakes, and birds of brilliant plumage, such as parrots, paroquets, and humming-birds, of many varieties, the gay feathers of which are still worn for ornament, as in the time of Montezuma. The low grounds swarm with noxious insects, and the lakes and rivers contain an abundance of fish of various kinds. All the domestic animals which were brought over from Europe by the Spaniards have multiplied greatly in Mexico, owing to the wide tracts which afford pasture-ground for nine or ten months of the year. Horses, oxen, sheep, and hogs may be seen running wild over the open country. Jerked beef and horns are exported. Sheep are numerous on the table-lands, especially on the northern, which are much drier; and wool is an article of exportation. Horses and mules are exported in great numbers to the United States. On the plains the American buffalo abounds. Game is abundant, especially deer and hares. The cochineal insect is reared with great care on the table-land of Mixtecapu, whence by far the greatest part is brought to the markets of the world. The silkworm is also reared with great success.

*Minerals.*—Mexico is rich in minerals, having mines of gold, silver, quicksilver, copper, iron, lead, tin, zinc, coal, petroleum, and antimony. The gold mines are mostly on the western side of the Sierra Madre, and, until the discovery of gold in Australia and California, they were the most productive in the world. The silver mines are on the western declivities of the Andes. During the time that Mexico was a Spanish colony, that is, from 1537 to 1821, the mines produced silver to the value of £400,000,000, and gold to the value of £14,000,000. Since Mexican independence was established the mines have produced silver to the value of £200,000,000, and gold to the value of £10,000,000. The ruby, amethyst, topaz, opal, garnet, and agate are likewise found; marble and various kinds of stone for building exist in abundance; and there are extensive deposits of sulphur in several parts of the country.

*Manufactures and Commerce.*—Owing greatly to the

high tariff on foreign goods, and to the productive soil of the country, a great increase in the prosperity of the manufacturing interests of Mexico has taken place, an increase likely to progress as the railways in course of construction open up the inland districts. The cotton and woollen industries, &c., are the most important, and sugar refining, brewing, and distilling are carried on on a large scale.

The geographical position of Mexico, between the Atlantic and Pacific Oceans, and the variety of its natural productions, specially adapt it for commercial enterprise; but its resources have never been fairly developed. The commercial intercourse between the coast and the tablelands is difficult on account of their steep ascent. Even in those parts where no obstacle exists to the use of carriages, the goods are commonly carried by mules, on account of the great number of these animals and the low price at which they are bought.

The principal ports are—Vera Cruz, Tampico, Matamoros, and Monterey, on the Gulf of Mexico; and San Blas, Acapulco, Mazatlan, and Guaymas, on the Pacific and Gulf of California. The commerce of Great Britain with Mexico has undergone great fluctuations.

The exports are of a miscellaneous nature, the most notable being mahogany, sisal hemp, coffee, orchil, sugar, Brazil wood, indigo, logwood, Nicaragua wood, copper, hides, jalap, vanilla, &c. The principal articles exported from Great Britain to Mexico are—cotton, linen, and woollen manufactures, hardware, silks, leather, wearing apparel, arms, iron, spirits, beer, ale, &c.

In the chief want of Mexico, good means of communication, great progress is being made; the roads are being repaired or extended, and railways constructed, which must rapidly have their influence in developing its resources of all kinds, agricultural and mining, and in rendering travel safe. There were over 8400 miles of railway open for traffic in 1885, and 200 miles under construction.

*Government and Revenue.*—The present constitution of Mexico bears date 5th February, 1857, with subsequent modifications down to 3rd October, 1882. By its terms Mexico is declared a federative republic, divided into states—nineteen at the outset, but at present twenty-seven in number, with one territory and the federal district—each of which has a right to manage its own local affairs, while the whole are bound together in one body politic by fundamental and constitutional laws. The powers of the supreme government are divided into three branches, the legislative, executive, and judicial. The legislative power is vested in a Congress consisting of a House of Representatives and a Senate, and the executive in a president. Representatives—227 in 1885—elected by the suffrage of all respectable male adults, at the rate of one member for 40,000 inhabitants, hold their places for two years. The qualifications requisite are, to be twenty-five years of age and a resident in the state. The Senate consists of fifty-six members, two for each state, of at least thirty years of age, who are returned in the same manner as the deputies. The members of both Houses receive salaries of 8000 dollars a year. The president is elected by electors popularly chosen in a general election, holds office for four years, and cannot be re-elected until another period of four years has elapsed after the expiration of his term. Mexico, which for half a century after the declaration of independence in 1821 was one of the most unsettled states of Central America, seems now to have ceased to be the scene of incessant internecine strife. It has not witnessed a single *pronunciamiento* since the year 1869, and it may fairly be hoped that the country has at last really entered on a career of moral and material prosperity. The finances were in great disorder until 1880, but since that time, according to official returns, the regular expenditure has been kept within the revenue.

The largest source of income is from the customs, which were considerably augmented during the occupation of the French from 1863 to 1866. The revenue is about £7,000,000 per annum. The foreign debt is said to be about £20,000,000, and the internal about £10,000,000. Diplomatic relations between Great Britain and Mexico were interrupted from 1867 until the year 1885, when a minister was again appointed. Mexico has an army of 3700 officers and 45,323 men on the peace-footing, and 160,963 men on the war-footing; and a fleet of six gunboats and two torpedo-boats.

*Religion and Education.*—The prevailing religion is Roman Catholic, but the church and state are independent of each other, and there is toleration of all other religions. There are sixty-two Protestant churches with over 20,000 adherents. No ecclesiastical body can acquire landed property. Primary education has been declared compulsory, but the law is not enforced. Schools are supported partly by the central, partly by the state governments, and partly by beneficent societies. In the year 1884 there were in Mexico 8986 public elementary schools, with 600,000 pupils, and 138 for superior and professional education, with an attendance of 17,200.

*Inhabitants.*—The Mexican population comprises five different classes.—1. The whites, constituting the aristocracy of the country, as the largest landed proprietors, and generally called Creoles. They are the direct descendants of the Spaniards, and their number is estimated at 300,000. 2. Those who consider themselves whites. They are the descendants of Spanish and Indian parents, and chiefly follow the military or legal professions, hold situations under government, or are small landholders. This class numbers about 800,000. 3. The Indians, reduced to a state of abject misery and servitude. They live in villages, and constitute the agricultural class. Though slavery is not recognized by law, yet practically many of these people are slaves. Receiving very inadequate remuneration for daily labour, they are frequently obliged to apply to their employers for a loan, and thus become involved inextricably in debt. Their number is 3,765,044, and they speak the Aztec or old Mexican language. 4. The mestizos, or mixed races, distinguished by various names—the issue of an Indian and a negro being called a zambo; that of a white and negress, a mulatto; of a white and mulatto female, a terzeron; of the latter and a white, a quadroon; and so on till the eighth or tenth shade of colour. The number of mestizos in the country is stated at 1,600,000. 5. The Europeans, among whom the Spaniards predominate; but there are a large number of French and Germans—there being scarcely a town in which a French tailor and German watchmaker cannot be found. The number of Spaniards is about 40,000.

The aboriginal tribes resemble each other in the principal features of their face and body, but they speak languages or dialects which differ greatly. The language which is most extensively used is that of the AZTECS, which seems to be understood by nearly all the tribes that inhabit the country between 18° and 28° N. lat. It contains no r, and most of the words are of excessive length. The *Indios Bravos*, or savage tribes, inhabit the countries north of 38° N. lat., along the Rio Gila, the Bolsom de Mapimi, the mountain ranges which include the vale of the Rio del Norte and the north-western district of Texas.

The population in 1882 was 10,025,649. The Indians are stated to be rapidly decreasing, forming in 1874 one-half the population; in 1882, as already said, they were returned at 3,765,044. Theoretically, distinctions of race are abolished by the constitution of 1824, and many Indians have held high positions in the state; thus the presidents Benito Juarez and Guarjates were both of pure Indian descent.

*Architectural Antiquities and Ancient Religion.*—The aboriginal architecture of Mexico resembles that of Egypt, not only in the vast scale and massiveness of its monuments, but in the application of the pyramid. Pyramids not inferior to those of Egypt, and some of even still larger dimensions in their plan or base, exist in the Mexican territories; and examples of the second class occur in pyramid towers—erections which from a square or oblong base rose by successive terraces to a small summit platform. The pyramid tower of Cholula resembles in no small degree the temple of Belus, as described by Herodotus, inasmuch as it consists of eight storeys, each forming a platform on which stands the one above it. Some of these edifices appear to have been not temples only, but to have contained sepulchral chambers and apartments for the priests; they had also descending galleries leading down into caverned recesses or halls. At Teotihuacan, about 8 leagues to the north-east of the city of Mexico, are an immense number of pyramids, several hundred small ones ranged in files or lines, and two larger ones consecrated to the sun and moon. Each of the latter is divided into four platforms, the slopes between which consist of steps. On the summit was a colossal stone statue covered with plates of gold, which were stripped off by the soldiers of Cortes, and the statues themselves destroyed. The builders were unacquainted with the principle of the true arch; the rooms are consequently narrow, as the vaulting is formed by the Maya arch. This was made by bringing the courses of stone nearer together till they meet in the centre, precisely as the Etruscans did in Europe at the dawn of civilization.

Besides monuments which are chiefly works of magnificence, others exist which attest the high degree of civilization attained by the aboriginal nations of Mexico, such as Cyclopean roads and bridges. The former of these were constructed of huge blocks of stone, and frequently carried on a continued level, so as to be viaducts across valleys. There are also throughout Central America numerous excavations or rock-hewn halls and caverns. They resemble the Cyclopean fabric near Argos, known by the name of the Treasury of Atreus, are generally dome-shaped, and the central apartment is lighted through an aperture in its vault.

Owing to the imperfect character of the Mexican records, very little can be ascertained concerning the rise and growth of the religious system of the country previous to the invasion of the Spaniards; but in the works of the priests and chroniclers of the latter we have a full account of the system they found prevailing when they entered the country, together with the legends then current among the people. From these works we learn that the people were polytheists, and that they worshipped a large number of deities, to whom different attributes and functions were assigned. To the highest and perhaps the oldest deity, Tezcatlipoca, they prayed for help in war and against bad government, for health and fortune, and for the pardon of sin. The goddess Centeotl was adored as the patron of the maize plant, maize forming the staple article of food, while Miclantecatl was regarded as the ruler over the spirits of the dead. There are also traces of a mysterious deity, whose nature and attributes seem to have been the conception of a lofty and spiritually minded king, which had no image, and was worshipped only by offerings of incense and flowers, while nature worship found a place in the adoration of the gods of the sun and moon, with a host of minor gods, who presided over the mountains and forests. In addition there were a number of inferior deities who were worshipped as the patrons of the different events and occupations of life. The greatest cult, however, was that of the terrible war god Huitzilopochtli, whose grim worship hung like a black shadow over the land, and led to the perpetration of atrocities for which it would be difficult to find a parallel even in Dahomey or Ashantee. The great temple (Teocalli) of this god stood in the centre of an immense walled square

in the city of Mexico, being placed on the summit of an oblong pyramidal structure, 375 feet long by 300 wide at the base, which rose, by five stages, to a height of 86 feet. In front of the temple of the deity, in a prominent place, so that it could be seen from all around, stood the green stone or altar, upon which the human victims were offered in sacrifice. In this ceremony the victim was flung down, bent backward over the dome-shaped top of the stone, his breast was slashed open by the obsidian knife of the priest, his heart was torn out and held up before the god, after which it was either burned with incense before him, or minced small and mixed with meal was eaten by the worshippers. The body of the victim served to furnish a cannibal feast for the worshippers, and the skull was preserved in the *tzompantli*, or skull place, within the inclosure, where thousands of them were built up into towers. In the worship of the rain gods infants gaily dressed were carried in procession, and then drowned in the lakes or sacrificed upon the mountains; the victims of the fire god were burned, those of the harvest gods crushed between two stones, and those of the god of silver and gold, after being killed were flayed, that the worshippers might wear the skins as decorations. It is said that in the years immediately preceding the Spanish conquest, when the presiding monarch was an ardent worshipper of the gods, not less than 20,000 victims were annually immolated, most of them being obtained as prisoners of war from the surrounding countries. To obtain victims the countries around were harried far and wide, and the whole kingdom was organized as a fighting community. The priests were extremely numerous and powerful, and Cortes found no less than 5000 attached to the great temple of Mexico alone. In addition to the sanguinary rites of the sacrifices, the services of the temples included fasting, prayer, chanting, processions, dances, and much burning of incense. A common act of devotion was to draw blood from the body by thrusting sharp sticks or thorns into the arms, legs, trunk, or through the tongue, and maize and vegetables, rabbits and quails were sometimes offered to the gods as acceptable sacrifices. The priests officiated at the weddings and also at the funerals. They practised cremation, and when a king or great man died his wives and slaves were put to death and their bodies burned, so that the departed ruler might not lack due attendance in the world of spirits. The priests also had under their control the whole of the education of the young, large schools being attached to the different temples. Boys were instructed how to carry burdens, paddle the canoe, and fish, while girls learned to spin, weave, grind maize, and cook. Both boys and girls were employed in the services of the temples, and moral instruction always formed part of the curriculum. The sons of warriors were early trained to arms, and those of artisans were taught by their fathers to follow the family trade. The children of the nobility received a more elaborate education, being instructed in history, picture writing, theology, astrology, and law. Astrology was largely practised, and the priests drew horoscopes in accordance with an intricate and elaborate system, and were called upon to advise in every important event of life. The religious beliefs and practices of ancient Mexico are of peculiar interest to the students of comparative theology, inasmuch as they seem to have been developed independently of any contact with the Western world. In the study of the religious systems of Asia and Europe it is often difficult to ascertain the extent of their indebtedness to each other, but in Mexico and Peru we encounter religions which appear to have arisen and grown apart from any influence from the rest of the world. It is at once instructive and interesting to compare the beliefs and customs of these countries with those of the Old World, and it is beyond question that in every point of importance phenomena identical or analogous can be found by the attentive student, though a common origin seems altogether

out of the question. For a careful study of this subject see the Hibbert Lectures of 1884, by A. Réville, on the "Native Religions of Mexico and Peru" (English translation, by P. H. Wicksteed, London, 1884).

*History.*—Though Columbus in his last voyage approached the peninsula of Yucatan; he did not come in sight of it. Thirteen years later (1517) the peninsula was discovered by Francisco Hernandez Cordova, who sailed along the coast from Cape Catoche to Campechy Bay. The following year Juan de Grijalva continued the discoveries along the same coast northward to the mouth of the Rio Panuco; he visited the islands of Sacrificios and San Juan de Ulloa. His account of the wealth of the country excited the desire of conquest. In 1519 Hernando Cortes landed at the place where Vera Cruz now stands; and with his little army he soon ascended the table-land, the numerous inhabitants of which he found united under a powerful sovereign, the Emperor of the AZTECS, Montezuma. Within the limits of this empire there were some small republics, of which that of Tlascala united with Cortes. Cholula was also a republic, and the name of a third is preserved, that of Huajocingo. After the conquest Mexico became a kind of colony to Spain, governed by officers sent from the mother country. Numerous Spaniards settled in the country, and in the course of three centuries there grew up many mixed races. The history of the Mexican conquest has been ably treated of late years by Prescott and Sir Arthur Helps.

By the intrigues of Bonaparte in 1808 the royal family were compelled to abdicate the throne of Spain, and he conferred the whole Spanish monarchy on his brother Joseph, up till then King of Naples. The Spaniards in Mexico and the Creoles were unanimous in declaring their resistance to the government established by the French. The viceroy could no longer receive orders from Spain, and it was necessary to organize a government which should act independently under a certain sanction, and with authority. But as to this point they disagreed. The Creoles wished to establish a national representation; the Spaniards opposed the measure, and prevented its establishment. The Creoles submitted; but the public mind had been agitated by the discussions which had taken place, and soon afterwards, in 1810, the natives and the mestizos rose against the government. From that year till 1820 there was a constant succession of wars between the government and the advocates of liberalism, which terminated in favour of the government.

The events which occurred in Spain in the beginning of 1820 suddenly changed the aspect of affairs, and deprived her of the most valuable of her possessions in America. The Spaniards and the Creoles, who had formerly made common cause, were now divided into two parties, royalists and constitutionalists. Iturbide, a clever and ambitious Creole, played one party against another with such tact, that he got himself proclaimed by the army Emperor of Mexico, on 18th May, 1822. He was acknowledged by the Mexican Congress, which had been opened on the 24th of February; but a struggle for power soon arose between Iturbide and the Congress, which the emperor terminated by forcibly dissolving the assembly, on the 30th October, 1822. Iturbide meeting with opposition, ultimately abdicated in March, 1823, and went to Europe, whence, however, he returned in 1824, but he was shot at Padilla, in Tamaulipas, and Mexico now became a republic.

Owing chiefly to disputes about Texas, war between Mexico and the United States of North America commenced 24th April, 1846, near the mouth of the Rio Grande del Norte, and terminated 15th September, 1847, by the capture of the city of Mexico by the American army under General Scott. The terms of a treaty were then negotiated, and were agreed to by the Mexican Chamber of Representatives in May, 1848. By this treaty New

California and New Mexico were given up to the United States, and the boundary line between the two countries fixed. Under the presidency of Juarez Mexico gradually fell into a deplorable condition of anarchy, and the pecuniary claims of several European governments and other influential creditors led England, Spain, and France to undertake an armed intervention. An expedition sailed for Vera Cruz in 1863, contributed by the three powers in a certain proportion. England and Spain having obtained the satisfaction they desired soon withdrew; but France determined upon establishing law and order in the disorganized country. Large bodies of troops were poured into Mexico; the republicans were repeatedly defeated in battle, and finally, the co-operation of several of the leading Mexicans being secured, an empire was established, and the Austrian Archduke Maximilian, in 1864, accepted the imperial crown. He was immediately recognized by the different European powers, but his position was never well established, owing to the avowed hostility of the United States government and people, at whose request the Emperor Napoleon withdrew his troops at the close of 1866. The Mexican Empire immediately collapsed, and after a gallant but ineffectual resistance the Emperor MAXIMILIAN was betrayed into the hands of his enemies and shot on 19th June, 1867. The affairs of the country were then administered by Juarez until his death in 1872, when he was succeeded in the presidency of the republic by the chief-justice, Lerdo de Tejada. As previously stated diplomatic relations between Mexico and the United Kingdom were resumed in 1885, after having been suspended eighteen years. (See "Mexico To-day," by T. U. Bruckelhurst, London, 1883; "Travels in Mexico, and Life among the Mexicans," by Frederick A. Ober, Boston, U.S., 1884.)

Mexico, capital of the republic of Mexico, is situated nearly in the centre of a wide plain, 7468 feet above sea-level, called the Vale of Tenochtitlan, which was the name given to the town before the year 1580. This vale has an oblong form, extending from south to north 52 miles, and from east to west 34. About one-tenth of its surface is occupied by four lakes. The largest of these lakes, that of Tezcuco, covers a surface of 77 square miles; the Lake of Chalco contains a small island and the pleasant village of Xico; the Lake of St. Christoval covers about 27 square miles; the Lake of Zumpango occupies about 10 square miles, and is divided into two portions by a dyke; the eastern is called the Lake of Coyotepec, and the western that of Zitlatetec. To carry off the superfluous waters a canal has been made through the mountains of Nochistonga, which lie north-west of the Lake of Zumpango. This stupendous work, known by the name of the Desague of Huehuetoca, is above 12 miles long, and for more than 1000 yards is cut through rocks from 60 to 75 feet high. Some of the surrounding mountains attain a height of from 15,000 to 18,000 feet above the sea-level.

Mexico is one of the finest cities in the world. It is encircled by walls and entered by gates, to which several thoroughfares lead. The streets are very wide, and at right angles to each other. They are badly paved, and have side-walks of flat stones. The public edifices are numerous, substantially built, and in good style. The private houses, though spacious, are rather low, seldom exceeding one storey; they are mostly built of stone, and decorated by painting and mosaic work on the outside. The roofs of the houses are flat, and they sometimes communicate with one another for a considerable distance, and when seen from an elevation they look like immense terraces. The houses are all squares, inclosing open courts, which are surrounded by corridors. The entrance leads through a large gate into the court, and the stairs are opposite to the gate. The best apartments are towards the street, and all the windows are ornamented with balconies.

The principal square is the Plaza Mayor, which covers

12 acres of ground, and on two sides is surrounded by the cathedral, national palace, museum, and a new market-place; and on the two other sides by shops and dwelling-houses, with the exception of the Casa del Estado, or the Palace of Cortes. This square is the market for vegetables and fruits; but manufactured goods are sold in the Portales, or covered colonnades, of which there are several on a large scale, and all well supplied with goods from Europe and China. Several principal shops open into the Portales, and innumerable petty vendors display their wares, crowded on tables, in boxes, and in baskets. The Parian or bazaar is a square building, divided into uniform compartments by two principal cross streets, and others subdividing it. The national palace is a building of great extent, including a number of squares and inner courts, with separate staircases and suites of apartments. It comprises government offices, a mint, and a prison, and has also a botanic garden and three barracks. There are numerous Roman Catholic and six Protestant churches, and forty Franciscan and Dominican convents, a college of engineers, theatre, bull ring, and several aqueducts; public library, geological museum, a government cigar factory, town-hall, exchange, &c. The Acordada, or chief prison, the hospital, and the academy of arts are all fine buildings. The numerous churches and convents, with their cupolas and steeples, give the town a grand appearance. The cathedral stands on the ruins of the great Teocalli, or temple of the god Huizilopochtli. The interior is lofty and imposing, being gorgeously ornamented, and having a high altar, with a figure of the Virgin, the dress of which is said to contain, besides other gems, diamonds to the value of 3,000,000 dollars. The building itself is 426 feet in length, by 203 in breadth, and is of mixed Gothic and Italian architecture. It contains the *kellenda*, or stone covered with hieroglyphics, by which the Aztecs calculated their calendar with marvellous correctness.

The Alameda, or public walk, at the western extremity of the town, resembles a park, and is planted with a great variety of trees. The city is supplied with water by two aqueducts from the mountains. The provisions and vegetables are generally brought by small boats over the Lake of Texcoco and the canal of Iztapalapan, which leads from the Lake of Xochimilco to the town.

The population of the city of Mexico is about 290,000, consisting mostly of Creoles, or descendants of Spaniards. The lowest class of the people live in a state of abject poverty, and owing to defective drainage the death-rate is forty-four per 1000. There are a few manufactures, comprising gold and silver lace, silversmiths' work, coaches, and woollen and beaver goods, but most manufactured articles are imported. Four trunk lines have their termini in the capital, and there is good telegraphic communication.

**MEXICO, GULF OF**, is a large inland sea, united by numerous straits with the Atlantic, from which it is separated by a row of islands and widely extended banks. The long chain of the Antilles forms its eastern boundary between 10° and 20° N. lat.; and several small banks, with the Great and Little Bahama Bank, extend along it from 20° to 26° N. lat. It is divided from the Pacific Ocean by the Mexican isthmus, which unites the two Americas. The length of the whole sea, from E.S.E. to W.N.W., is not much short of 8000 miles. It is divided into two portions by the island of Cuba, which lies across it from east to west. Of these portions the southern, in modern times, has obtained the name of the Caribbean Sea, while that of the Gulf of Mexico has been limited to the northern portion.

The Caribbean Sea, which extends from east to west nearly 2000 miles, with an average breadth of less than 500 miles, is (west of 80° lon.) lined by numerous reefs and low wooded islands, called keys, which in the Mosquito Gulf and the Bay of Honduras increase in number, and render navigation more intricate and dangerous. The Gulf of Mexico, or the northern portion of the basin, is united

to the Caribbean Sea by a strait about 120 miles wide, which runs between Cuba and Yucatan. The length of the gulf, from Cape Sable in Florida to the eastern coast of Mexico, is more than 1000 miles, and its breadth towards the west more than 700 miles; but between Yucatan and Cuba on the south, and the shores of Louisiana and Alabama on the north, it does not exceed 550 miles.

The eastern trade-winds prevail during the summer from May to November, and on the eastern border along the islands all the year round. In the Gulf of Mexico the Nortes, or northern gales, are much dreaded by navigators. A strong current sets into the Caribbean Sea from the Atlantic; but the direction of the various currents is afterwards determined by the peculiar curvatures of the gulf. Lying under a nearly vertical sun, the temperature of the surface water is 86° Fahr. in summer, or 6° above the water of the Atlantic. This circumstance, together with the constant inward pressure of the trade-wind, places the Gulf of Mexico under the conditions of a great caldron, constantly lipping to overflow. This high temperature, combined with the inward pressure of the equatorial current through the channel of Yucatan, gives origin to that remarkable current or great ocean river called the Gulf Stream.

**MEXICO, NEW.** See NEW MEXICO.

**MEYERBEER, GIACOMO**, the famous operatic composer, was really named Beer (*Jakob Meyer Beer*), and his brother Michael, the poet, actually used the old family name. The composer further followed a then prevalent custom of Italianizing his personal name, putting Giacomo for Jakob. Meyerbeer was a Jew, the son of a Berlin banker, and was born at Berlin in 1794. While yet a boy he attracted the notice of Clementi, who gave him pianoforte lessons as a great favour, and at nine years of age he was reckoned among the leading pianists of Berlin. Although Meyerbeer's parents were wealthy as much pains were taken with his thorough musical training as that afterwards lavished by another pair of Jewish parents upon their son, the gifted Mendelssohn, in the same city. Meyerbeer had for tutor in composition the same distinguished man, Zelter, who is so well known as the guide and friend of Mendelssohn; but unlike the gentler Mendelssohn he could not bear with Zelter's severity, and left him for Bernard Weber, one of the famous Abbé Vogler's pupils. His master showed a fugue of his to Vogler, and although the old pedant tore it into rags and tattered with his fierce criticism, accompanying this "scholar's fugue" with a "master's fugue" of his own on the same subject when he contemptuously returned it, he was conquered by Meyerbeer's frank acknowledgment of the justice of the condemnation and his immediate production of another and far better fugue written upon Vogler's principles. In 1810, therefore, Meyerbeer was invited to become a member of the hard-working little band gathered round the crabbed old thewist at Darmstadt. The great Karl Maria von Weber was one of his companions and was very good to Meyerbeer, though Weber was now writing beautiful work and was twenty-four, while Meyerbeer had written nothing worth having and was but sixteen. All the youths had to produce work on given themes every day, and every one's work was tried by Vogler in the evening amidst the fire of criticism from all the others. Meyerbeer rapidly improved, and wrote a few operas and an oratorio, and his well-known "Sacred Songs" for four voices, in Klopstock's words. Going to Vienna to produce one of these operas he heard Hummel play, at once grew dissatisfied with his own style, and withdrew from public appearances until he had, by the severest work, quite remodelled his playing on Hummel's model. He then appeared and was enthusiastically received. His opera had failed, however, and in his thorough-going way he set off for Italy to study better how to write for the voice. As with Hummel and the pianoforte so now



did it happen to him with Rossini and the opera. He heard, was enchanted, and to the horror of Weber at once set to work to cast off his German style and acquire the new Italian operatic methods. Even against Rossini he obtained a hearing, and half-a-dozen Rossinian operas flowed quickly from his pen. Weber pleaded hard with him: "My heart bleeds," said he, "to see a German composer of creative power stoop to become an imitator in order to win favour with the crowd." Weber produced his friend's earlier operas, visited him, left him by will an unfinished opera to complete for him, and in every way showed his trust in his regeneration to the last.

Weber was mistaken. Meyerbeer was an eclectic of the eclectics. He was incapable of adopting any definite style. All things beautiful were desirable to him, and the operas he was now about to write, famous and great as they are, are a very patchwork. One moment he aims at antique rigour, and the next he indulges in a Rossinian flourish; he interrupts what might be a grand scene among the tombs of a convent cemetery by a ballet in the ultra-French style; a magnificent burst of pure melody closes with a piece of mere claptrap to show off the voice, or a pure strain of harmony gives way to a bald succession of trite chords. Such is this versatile, eminently original, and laboriously painstaking composer. His nervous fidgetiness over the never-finished scores of his enormous operas, which cannot be performed without large omissions, is phenomenal. Half bars or quarter bars deface the page through his eagerness to indicate the exact effect he desires to obtain. Frequently at rehearsal the performers found alternative passages in variously coloured inks, which they tried over and over again, till the fastidious composer decided between them. No one can but admire immense painstaking; Meyerbeer carried it almost to monomania. It arose indeed from his morbid susceptibility to opinion. He dreaded his critics and the public and his own reputation, as few really great men have done; and put off production for years, lest any minute part of his work should not have received his utmost elaboration. A word of doubt or a suggestion would set him upon weeks of toil.

His first great success, the production of "Il Crociato," at Venice, in 1824, when he was publicly crowned on the stage, acted upon him in this curious manner. It seemed as if it terrified him. He who had written so rapidly now produced nothing for seven years. He lived at Paris after 1826, married, studied incessantly French literature and character, wrote at his "Robert le Diable," and erased as fast as he wrote. In 1831 at last the great opera came out. Its success was worth the seven years' toil. Who does not know the splendid air, "Robert, toi que j'aime?" and who does not now deplore the nunn's ballet and the rest of the farrago of absurdities? But Meyerbeer knew his public perfectly, and he was rewarded by a *furore* of enthusiasm for the way in which, at the sacrifice of the truest art, he had condescended to write for their every fancy. The Paris opera coined money with the new wonder-work.

It took five years more of seclusion to work out the greatest of the master's operas, the superb "Huguenots," which appeared in 1836. Many scenes of this opera are of unrivalled power upon the stage, and it soon reached that crowning point in popular favour which it has never since lost. The effect upon Meyerbeer was so crushing that he never regarded as complete the opera he next took in hand, the "Africaine." His nervous fear of not equaling the "Huguenots," kept him all the rest of his life writing at this great work; and it appeared only in 1865, after his death. Meanwhile, having laboured for six years at it without coming to an end, he took up the "Prophète," and wrote that with unusual ease and rapidity. It was finished seven years after the "Huguenots"—namely, in 1843, but was not allowed to appear till 1849—the first important thing from Meyerbeer for thirteen years. Some

music to his brother's play, "Struensee," and a small military opera, "A Silesian Bivouac," for Berlin, had marked the interim, the last made very successful by the first appearance of Jenny Lind. In 1847 he produced at Berlin, when he was court conductor, Wagner's opera of "Rienzi," and later on the "Fliegende Holländer" (Flying Dutchman) of the same composer. Curious that the self-contained Meyerbeer should take so much pains over assisting an almost unknown and necessitous composer; and more curious still that Wagner should not, in gratitude, have held his hand from those bitter, brutal words with which he so constantly assailed the "miserable music-making Jew banker, to whom it occurred to compose operas." Wagner's ideal was higher than Meyerbeer's, but Meyerbeer, too, in his smaller sphere, was great. Again a long interval, almost of silence, and the world was rewarded by the "Etoile du Nord" (1854), intended to be an expansion of the Silesian opera, but touched and retouched till but very little of that remained. And in five years more (1859) his second opera in the lighter vein he had assumed appeared, under the title of "Dinorah" (Le Pardon de Ploermel). He produced nothing more except small cantatas, marches, overtures, &c., including the Overture for the International Exhibition of London in 1862, which introduces "Rule Britannia." The "Africaine," now nearing production, took all his energy; and in the end, this child of twenty-five years of work, was destined after all never to gladden its creator. It had begun to be partially rehearsed, and the aged composer was still touching and retouching, to the exasperation of the artists, when he died after a very brief illness, 2nd May, 1868. A few songs, especially the exquisite "Fisher-maiden," and the grandly dramatic "Monk," are all that live of Meyerbeer's work outside his six great operas.

**MEZELEON.** See DAPHNE.

**MÉZIÈRES,** a strongly fortified town of France, in the department of Ardennes, of which it is the capital. It stands on the Meuse, which here makes a considerable bend, and washes the city on the north and south, opposite Charleville, with which it is connected by a handsome suspension bridge, and is 144 miles north-east of Paris, by the road through Soissons and Rheims. Mézières has a population of 4786, and is strongly fortified; it has manufactures of leather and edge-tools. This place was successfully defended by Bayard, with 2000 men, against an Austrian army of 40,000 men, in 1520; but was captured by the Germans after a lengthened siege on 2nd January, 1871, and occupied by them till 22nd July, 1873.

**MEZZANINE** or **ENTRESOL**, a small low-pitched storey, usually situated above the basement and beneath the first floor; but in general any small storey between two larger ones.

**MEZZO** (fem. *mezzo*), the Italian for half, enters into many combinations now received as English words, such as *mezzanine*, a half storey in architecture; *mezzo soprano*, a lady's singing voice intermediate in compass and quality between the contralto and soprano; *mezzo voce*, half-voice, a moderate strength in singing, neither loud nor very soft; *mezzotinto*, a sort of engraving in which a half-tint is first prepared over the whole plate, &c.

**MEZZOTINT** (Ital. *mezzotinto*). See ENGRAVING.

**MI**, in the ancient solmisation and in the modern Tonic Sol-fa use, is the name of the mediant or third degree of the scale, the first degree or tonic or keynote being always called *do* (*do, re, mi, fa, sol, la, si, do*). But in those systems which always call the note *C do*, whether *C* happened to be the keynote of the scale or not ("systems of fixed *do*"), *mi* is always the note *E*.

In the article **HEXACHORD** that curious mediæval system of short six-note scales is fully examined. Here it will be seen that the third degree, the *mi*, of the hard hexachord was *B* (the Third of *G*, keynote of that hexachord), and that the fourth degree, the *fa*, of the natural hexachord was *F*.



(the Fourth of C, keynote of that hexachord). Now the intervals B—F and F—B are tritones (i.e. have three tones, or six semitones); the first is less than a true Fifth, and the second more than a true Fourth, so that in strict contrapuntal music neither can be admitted in harmony or in melody. Hence the old rule

Mi contra Fa  
Diabolus in Musica.

against the "false relation" of the tritone. Afterwards, when the fixed *do* was adopted, B became of course *si*, though F still remained *fa*, and the jingle was changed to

Si contra Fa  
Diabolus in Musica.

Of course in the later counterpoint this was a typical prohibition; the interval was forbidden under whatever name it occurred, as, for instance, G—C $\sharp$  &c.

**MIASCITE** is a crystalline rock, apparently of metamorphic origin, allied to syenite, but containing also elcrolite and several rarer accessory minerals. It has been so called from Miasik in the Ilmen Mountains, where it is extensively developed.

**MIASMA.** See MATARIA.

**MICA** is the name of a group of minerals—silicates of alumina and potash—with a variable amount of other bases. All the members of the group agree in having a very perfect basal cleavage; this affords very thin laminae that are flexible and elastic. The crystalline system to which the micas belong is somewhat doubtful; the crystals are prismatic, the cross section of which is hexagonal; but optically some are binaxial, and others, though apparently uniaxial, are considered to be binaxial minerals in which the divergence of the optical axes is so slight as only to be detected by the most delicate means. For this reason some authorities regard the micas as monoclinic; others divide them into two groups—hexagonal and monoclinic or rhombic. Most of the micas may be scratched by the finger nail, and in none of them does the hardness exceed 4; the specific gravity is about 3. The most commonly occurring varieties are:—

*Muscovite* or *potash mica*. This is the most common of the light-coloured micas; it is a constituent of granite, gneiss, and mica schist. It occurs in rhombic or hexagonal plates, and is distinctly binaxial. In some localities it occurs in large plates and is used as a substitute for glass, especially in stoves and lanterns.

*Lepidolite* is a lithia mica. It resembles muscovite, but is generally rose-red or lilac in colour, and contains from 2 to 5 per cent. of lithia; it often contains fluorine also.

*Biotite* is a magnesia-iron mica. It is the most common of the dark varieties. It is a constituent of many rocks, occurring generally in small plates or scales.

*Phlogopite* is a magnesia mica containing only a small percentage of iron. It is locally abundant in some districts, and occurs in large crystals in segregation veins.

*Lepidomelane* is a dark coloured mica, intermediate between the potash and magnesia varieties, but there is generally a large excess of iron present. *Astrophyllite* contains titanium and zirconium. Among the hydrated forms are damourite and margarodite. These minerals are talc-like in characters. Baryta mica and lime mica are rare minerals.

Mica is a common rock-forming mineral. When present in considerable quantity in some sedimentary rocks it produces a tendency to split into laminae, and it gives the rock a silvery or micaceous appearance. This is specially noticeable in micaceous sandstone.

*Mica schist* or *mica slate* is a rock composed of quartz and mica in layers, and, where felspar is present, passing into gneiss. Muscovite is the most usual variety present, but biotite also occurs. This rock is commonly found surrounding large protrusions of granite, forming a tran-

sition zone to less altered sedimentary rocks; it is then evidently of metamorphic origin, its mineral character being induced by the neighbouring igneous action, and it is probably but a passage rock to metamorphic granite.

*Mica diorite* or *mica trap* is a rock composed of compact felspar, through which are scattered scales of mica. The felspar is mostly orthoclase, but plagioclase is also found. Free quartz seldom occurs.

**MICAEROUS IRON ORE** is the name applied to the foliated scale-like or micaceous varieties of specular iron, or crystallized hematite. It is a highly valuable ore, containing, when pure, about 70 per cent. of iron. It is often found in thick veins or beds in gneiss or similar metamorphic rock.

**MICAH**, one of the minor Hebrew prophets, whose book is placed sixth in order in the present canon, but third in the Septuagint. The name Micah, a shortened form of *Micayahu*, "Who is like Jah?" is one common in the Old Testament, and the prophet is styled the Morasthite, probably from Morastheth Gath, the name of his birthplace, to distinguish him from the prophet Micahiah who lived in the time of Ahab. Of the life and circumstances of Micah but little is known, but from his book we learn that he prophesied during the reigns of Jotham, Ahaz, and Hezekiah (B.C. 756–697), so that he was a contemporary of Hosea, Amos, and Isaiah. From the tone of the book and its allusions it is evident that the prophet came from the ranks of the common people, and that he dwelt away from Jerusalem in the Judean lowlands near the Philistine country. One of his prophecies is distinctly assigned in the Book of Jeremiah (xxvi. 18) to the early portion of the reign of Hezekiah, before the reforming movement of that monarch had begun, but the date of the remainder can only be determined by internal evidence. In the opening section of the book, which extends over the first two chapters, we find a magnificent description of the coming of Jehovah to judge his people, both of Israel and Judah, for their sins and idolatries, followed by a denunciation of the greed and rapacity of the rulers, and of the folly of trusting to false prophets, and concluding with a promise that a remnant of the nation should be saved. In the second section, which extends over the third, fourth, and fifth chapters, the princes, rulers, prophets, and priests are rebuked in tones of withering indignation, and the destruction of Jerusalem is foretold as the judgment of Jehovah upon the land for its sin. But the threatening is again followed by a promise of restoration, and the prophet depicts, with a glowing and beautiful imagery, the glories of a restored and purified Israel. In the third section of the book there is a marked change both of style and subject, and in it Jehovah is represented as holding a controversy with his people. The opinion of Ewald that this section must be assigned to an anonymous prophet writing in the reign of Manasseh is adopted by many modern scholars, while Wellhausen has proposed a further division, and would assign the portion from chap. vii. 7 to the end of the book, to the time of the Captivity. The style of Micah, though obscure in places, is vigorous and forcible, and bears some resemblance to that of Hosea and Isaiah. Many of the allusions are drawn from the incidents of rural life in the lowlands of Judea, and like Isaiah of Jerusalem the prophet frequently introduces a play upon words to give point to his utterances.

**MICHAEL, ST.** The name Michael is used in several places in the Old Testament as a man's name, and its meaning is the same as that of Micah, Micahiah, &c., "Who is like Jah?" In the Book of Daniel it is given to one of the chief princes among the angels, who is represented as being the especial champion of the people of Israel. In the Book of Revelation, Michael is represented as the leader of the angels in the war with Satan on behalf of the church, and there is in the Epistle of Jude a reference to

Michael which seems to be derived from a rabbinical legend founded upon Deut. xxxiv. 6. By the Greek Church, 8th November is dedicated to St. Michael, St. Gabriel, and All Angels; but in the Western churches Michaelmas or the Festival of St. Michael and All Angels falls upon 29th September. In art St. Michael is usually represented clothed in armour and bearing a flaming sword. Sometimes a pair of scales is placed in one hand as a symbol of his office of judge over the souls of men. See also ARCH-ANGEL.

**MICHAELMAS**, the autumnal equinox, and one of the four quarter-days in England, occurring on St. Michael's Day, 29th September. Several ancient customs still survive, doubtless originally having reference to the equinoctial sacrifices, but the list yearly grows less. The custom of eating goose, transferred from Martinmas to Michaelmas Day, is perhaps kept up as vigorously as ever, because geese are then in fine condition for the table, but "St. Michael's cake" is now rarely baked in the Western Isles, though once universally provided at home as the domestic close of a general public festivity, and the Michaelmas "bumpings" (horse-play with travellers), which survived almost into this century at Bishop Stortford and a few other places, have now quite disappeared. Divination by crab-apples, gathered a little before, thrown loosely on a shelf, and examined on Michaelmas Day to detect some likeness to the initial of the beloved one's name, is not quite obsolete in the West of England. All these and other Michaelmas customs are highly obscure; many conjectures have been hazarded as to their original meanings with regard to the equinox, but the subject still waits a competent investigator.

*Michaelmas Term*, for law sittings, extends from 24th October to 21st December; at the universities it extends in Oxford from 10th October to 17th December, and in Cambridge from 1st October to 19th December, in each case following the long vacation.

**MICHEL, MONT ST.** See MONT ST. MICHEL.

**MICHELANGELO BUONARROTI**, the grandest and most powerful artist, whether as architect, sculptor, or painter, of modern times, was descended from the noble family of Canossa, in Tuscany, though the branch to which his father belonged had fallen into obscurity. He was born at Florence in the year 1475, a period peculiarly favourable to genius, when the states of Italy emulated each other in the cultivation of the liberal arts. Michelangelo, the bent of whose powers manifested itself in his earliest childhood, learned the elements of design in the school of Domenico Ghillandino, a celebrated professor in Florence; and so precocious were his talents, that his master paid him a handsome sum from his first entry into his studio as a reward for his services. While he pursued his studies with this master, a seminary was established for the promotion of sculpture by Lorenzo de' Medici, and Michelangelo was invited, among other youths, to study from the collection of antique statues arranged in the Medicean gardens. He began, not merely by copying, but by investigating the principles on which the Greek artists had wrought, and having found a head of a laughing faun considerably mutilated, he imitated that part of it which was perfect and restored what was wanting. Lorenzo was struck by this demonstration of vigorous capacity; and he invited the youth to reside entirely in his house, where he remained three years. This faun's head, a remarkable work for a mere boy, is still preserved in the Uffizi Gallery, Florence. The lad further executed for his patron a basso-relievo in marble, the subject of which was the "Battle of the Centaurs." Lorenzo died in 1492. His brother Piero continued to patronize Michelangelo, but in a different spirit. Treating art as a toy, he is said to have employed him, during a severe winter, to make a statue of snow; and as he manifested in all things the same frivolous spirit, he precipitated the downfall of his family, which was driven

from Florence in 1494. On this event Michelangelo retired to Bologna, where he contributed two statues to the church of the Dominicans; after a year's residence in that city he returned to Florence. During this time he made the celebrated statue of a "Sleeping Cupid," which was sent to Rome, where it was shown as a piece of sculpture which had been dug up from a vineyard, and was pronounced by various connoisseurs to be a genuine antique, and superior to anything which contemporary art was capable of producing. This statue having been purchased at a high price by the Cardinal S. Giorgio the trick was made known, and Michelangelo's reputation was so much augmented by it, that the cardinal, though vexed at the deception, invited him to Rome. He devoted himself during this, his first residence in the imperial city, to intense study, and executed several works, particularly a "Virgin weeping over the Dead Body of Christ" (Pieta), for St. Peter's; often claimed to be his most perfect work, on account of the beauty of its lines.

Several great works in art having at this time been projected by the government of Florence, Michelangelo, at the earnest advice of his friends, again returned to that city, and the first undertaking on which he exercised his talents was a gigantic statue of David, hewn from a solid block of marble. This sublime statue long ornamented the great square at Florence, but as the weather was injuring it, it was removed a few years ago to the Academy of Florence, where it still remains. The Gonfaloniere, Pietro Soderini, was now anxious to enrich the city with some grand production of Michelangelo's pencil. Leonardo da Vinci had been commissioned to paint a historical picture for one end of the hall of the ducal palace, and Michelangelo was engaged to execute another at the opposite extremity. He selected a subject from the wars of Pisa. This cartoon, with the exception of a few dismembered fragments, has perished, but as long as it existed it was studied by artists from all countries. Every variety of muscular movement and of bodily position was mastered in the most complete manner. Michelangelo had at this time attained only his twenty-ninth year, and had not only established his reputation as the greatest artist of his day, but had created, by the novelty and grandeur of his style, a new era in the arts. Pope Julius II. called him immediately to Rome, and commissioned him to make his monument, a work conceived on a scale which Michelangelo felt to be commensurate to his powers. But little of this monument was completed. It was to have been a vast quadrangle, with niches in the sides, adorned with figures of Victory supporting a massive block, whence a pyramid covered with bronze figures sprang, and round it were to have been ranged colossal figures of prophets and sibyls. One of the Victories, a group of two captives (at the Louvre), and the figure of Moses are the chief pieces now remaining. The latter is probably the grandest modern sculpture-piece in the world. It is in the church of San Pietro in Vincoli. Moses is seated, holding the tables of the law, one hand meditatively drawing aside his long beard. The Vulgate translates the rays\* of light which shone from Moses' forehead as *cornua* (horns), the Hebrew lending itself to this perversion, and consequently two horns project slightly from the summit of the forehead. The figure is beyond expression sublime and awe-inspiring. An outline of it is given in the Plates illustrating the article SCULPTURE. To the design which the great sculptor made for this monument Rome and the world are indebted for the magnificent Church of St. Peter's; for Michelangelo having suggested to the Pope that the interior of the old edifice would not allow sufficient space for the monument to be properly seen, the pontiff determined to rebuild the church on a larger scale.

Julius was ultimately induced, by the advice of his architect, Bramante, to suspend the execution of the monument, and he gave orders to Michelangelo to paint the

vault of the Sistine Chapel. Absorbed in the execution of the monument, he most earnestly endeavoured to decline the task of painting the chapel, and even alleged that he thought Raffaele better qualified to perform it; but Pope Julius allowed no impediment to stand in the way of his will, and Michelangelo, finding himself without an alternative, and impressed with a sense of the vastness and grandeur of the task, commenced his cartoons. He invited from Florence several artists distinguished as painters in fresco, a mode of practice in which he was then inexperienced, and the roof of the chapel was commenced by these assistants, under his direction; their execution, however, fell short of his expectations, and entering the chapel one morning he dismissed them all, threw their work from the walls, and determined on executing the whole himself. Having advanced to the third compartment, he had the mortification to find his labour frustrated by the bad quality of his materials, in which fermentation had taken place, and in utter disappointment he renounced the undertaking. The Pope, being made acquainted with this misfortune, sent to him his architect, San Gallo, who investigated the cause of the failure, and taught him how to correct it. Thus reassured he proceeded, and the pontiff hearing at length that the ceiling was half completed, could control his impatience no longer, and ordered the chapel to be opened for his inspection. Many other persons found admission, and among the rest Raffaele d'Urbino, who then first became acquainted with Michelangelo's powers as a painter. Struck with admiration he immediately changed his own style, and thanked God that he had been born in the same age with so great an artist. The work was now carried forward without interruption, and the whole was completed within one year and eight months from that time; an achievement which, whether we consider the magnitude and sublimity of the performance, or the almost incredibly short time in which it was executed, is unparalleled in the history of art. The Sistine Chapel ceiling is certainly the most powerful piece of painting in existence. It contains 200 figures, nearly all larger than life, and many of them stupendously colossal. The whole ceiling is painted to represent intricate architectural panelings, foreshortened with marvellous skill, and in these panels are representations of the creation, the fall, the deluge, &c.; the great triangular divisions at the springing of the vaults are filled with grand seated figures of the prophets and the classical sibyls who foretold the coming of Christ. (One of the latter, the Delphic Sibyl, forms the subject of a coloured plate in illustration of the article FRESKO.) The effect of the work is adapted with admirable accuracy to the vast height at which it is seen, and it is impossible to contemplate it without reverence and astonishment. The cartoons were begun in 1509, and the whole was finished by 1512.

The reign of Julius terminated in 1513, when Leo X. (Medici) became pope. It might have been expected that Leo X., who was renowned for taste and munificence, and who affected fully to appreciate the powers of Michelangelo, would have engaged him on some work worthy of his talents. There is, however, in his whole conduct towards this great artist a display of injustice not easily explained. The short reign of Adrian VI. which followed, although generally unfavourable to the arts, was less injurious to Michelangelo, as it allowed him leisure to proceed with the monument of Julius II.; but on the accession of Clement VII. (Giuliano de' Medici) that work was again interrupted, and he was called on by the new pontiff to build a library and sacristy for the Church of St. Lorenzo. In front of the altar of the Medici Chapel is a splendid group of the "Virgin and Child;" on one side of the chapel is the tomb of Giuliano de' Medici, with figures of Day and Night, and on the other side the tomb of Lorenzo de' Medici, with figures of Dawn and Evening. The statue of Lorenzo is popularly

called *Il penseroso*. The last three figures named are sketched in outline in the Plates SCULPTURE. The civil wars of Florence ensued soon after, and we find Michelangelo acting in the capacity of engineer. He had broken off his work for the Pope, and some of the figures are still not completely finished. On the expulsion of the Medici he was appointed superintendent of the fortifications by the local government, and he evinced extraordinary skill in fortifying the important post of San Miniato. The fortified walls still remain in part as Michelangelo left them. As soon as the tumult consequent on the sack of the city had subsided, Clement VII. ordered strict search to be made for Michelangelo, received him kindly, consulted him on various works, and the great picture of the "Last Judgment" was then projected. The death of Clement, in 1533, suspended these intentions, and Michelangelo was enabled to complete Moses and the other partly finished portions of the monument of Julius II. Michelangelo was now urged by Pope Paul III. to proceed with the picture of the "Last Judgment" on the end wall of the Sistine Chapel; he devoted to that immense work the labour of eight years, and it was finished in 1541. It was pronounced by contemporary criticism that Michelangelo had in that work excelled all his former productions; but the deliberate judgment of time inclines to decide that his great name as a painter is better sustained by the noble and elevating pictures on the roof and sides of the Sistine Chapel, than by the terror and gloom of the "Last Judgment." The career of Michelangelo is an example of the splendid results produced by great powers in conjunction with great opportunities. We next find him engaged in remodelling the capitol at Rome and constructing the magnificent fabric of St. Peter's. On this work, especially the dome (entirely his own construction), he was occupied during the whole remainder of his life. As he had occasion, among the number of persons employed in the undertaking, to promote some and dismiss others, he was beset by cabals and harassed by opposition; and machinations were even employed to deprive him of his office: but he was uniformly supported by the pontiffs, especially by Julius III., who regarded him with profound respect and veneration. For this great work he constantly refused any remuneration, declaring that he dedicated that service to the glory of God. This unaffected piety, so characteristic of the master, is also well seen as expressed in his sonnets, among the most finished of that class of poems, and in his interesting letters. As for the poems, three of them are known (or ought to be known) to all Englishmen in the magnificent paraphrases of Wordsworth. Especially grand is that one upon prayer, beginning thus:—

"The prayers I make will then be sweet indeed,  
If thou the Spirit give by which I pray;  
My unassisted heart is barren clay,  
That of its native soil can nothing feed.  
Of good and pious works thou art the seed,  
That quickens only when thou sayst it may;  
Unless thou show to us thine own true way  
No man can find it; Father, thou must lead."

Old age came upon Michelangelo not unaccompanied with the physical infirmities which belong to it, but he retained the vigour and alacrity of his mental faculties to the close of his long life. He died on the 17th February, 1564, having nearly attained his eighty-ninth year. His last words were, "In your passage through this life remember the sufferings of Jesus Christ." He was buried at Rome, but his remains were afterwards removed to the Church of Santa Croce at Florence. Michelangelo is imperfectly represented in his smaller works. Some not fully authenticated examples are in the National Gallery, the best being unfinished. There is a noble easel picture of him, however, a "Holy Family," in the Uffizi at Florence.

He was the embodiment of stern earnestness, melancholy

even to gloom in his tone; caring for the strong, the terrible, the sublime, rather than the beautiful; painting or carving figures almost bare of accessories, landscape and the like. In his own life he was a model of piety and benevolence; hasty, but ever ready to condone the offence; simple to excess in his way of life, and austere in the purity of his morals. His greatest work was done under bitter compulsion, Julius II. even daring to threaten to have him thrown from the scaffold if he did not work faster, and once actually striking him. (Michelangelo at once sprang from the scaffold and left Rome. He was in want of common necessities, and the Pope, knowing this, bribed him to return by an instalment of 50 ducats and some kind words.) His work has been even worse treated than the great man himself. From the time when the Sistine ceiling hung aloft fresh in all its first glory of design and colour, only the coarsest usage and the most barbarous neglect have befallen it. Common workmen have gone over it, as Mr. Wilson has ascertained, with great plasterer's brushes dipped in some deleterious liquid, removing the "secco," or dry final touches, and corroding some of the most important parts of the solid fresco. Dust and cobweb hang like a veil between the work and the spectator, and a crust of soot adds its grime to every part; for, in addition to the usual smoke of tapers, which are the bane of all works of art committed to the keeping of the Roman Church, periodical bonfires, lighted at the accession of each pope—therefore some forty times since the ceiling was painted—have sent up their smoke from the floor of the chapel. It is hardly to be believed that with all the twenty courts and 4422 rooms of the Vatican Palace adjoining, no place has been found to burn the papers accumulated during an election conclave but a building sacred alike to religion and art. The photographic autotypes also reveal tremendous cracks in the ceiling, the result of the speculation and bad materials which have undermined most of the Roman buildings of that and the preceding period. ("Life of Michelangelo," C. H. Wilson, London, 1876; "Five Great Painters," Lady Eastlake, 1883; "Life and Translations of the Sonnets and Letters," Harford, London, 1857.)

**MICHELET, JULES**, is the most remarkable historian that France has produced; indeed, for originality and interest, there are few historians of any age or time to surpass him. He was born at Paris in 1798 and became a schoolmaster. He wrote on historical subjects from time to time, and in 1830 was appointed archivist of the kingdom and tutor to the Princess Clementine. In 1838 he obtained a professorship at the Collège de France. His historical manuals are splendid efforts of compressed detail; such are the "Modern History," the "French History up to the Revolution," and the more extended "History of the Revolution" itself (six vols., 1847-53). Absorbed in the last-named he let the revolution of 1848 pass by almost unnoticed, but he refused to take the oath of allegiance to Napoleon III. after the *coup d'état* in December, 1851, and was dismissed from his post as archivist in consequence. About 1833 he began working at his masterpiece, the magnificent "History of France," which occupied him till his death. It is violently anti-Jesuit in tone and ultra-republican, but it is vivid as a lightning flash, and stamps scene after scene indelibly on the mind of the astonished reader. The past lives again with an almost incredible completeness, details are made subservient to the picture of the whole; in fact, the arts of the poet and the novelist and the coloured light of imagination seem at times distanced in their capacity to afford absorbing interest by the facts of history as seen in the wondrous setting of Michelet.

Grand as this history is, it is only a part of his immense labours. In polemics "The Jesuits" (1843), "Priest, Wife, and Family" (1844), "The People" (1846); in other branches of literature, "Birds" (1856), "Insects"

(1857), "Love" (1858), "Woman" (1859), "The Sorceress"—are all works of the highest rank and the most intense interest. Victor Hugo is the only writer to whom Michelet can be fairly compared in the general style and mode of presentation of his subject. Michelet died in 1871, and several works were found prepared or almost prepared for the press, some of which have since appeared. His works, even without these, exceed fifty volumes.

**MICHE'LLA.** See CHAMPACA.

**MICH'IGAN** (pronounced as if spelt with an *sh*), one of the United States of North America, consists of two distinct portions, the principal of which, or Michigan Proper, is bounded north by the Strait of Mackinaw, which connects Lake Michigan and Lake Huron; east by Lake Huron, St. Clair River, Lake St. Clair, Detroit River, and Lake Erie; west by Lake Michigan; and south by Ohio and Indiana. The other portion of the state lies to the north-west, and is bounded north by Lake Superior, east by St. Mary's Strait, west by Montreal River, and south by Lake Michigan, Green Bay, and Menomonee River. The total area is 58,915 square miles. The population in 1880 was 1,634,095.

**Surface and Soil.**—Michigan Proper, which is chiefly a peninsula between Lake Michigan and Lakes Huron and Erie, is generally level, with few elevations that rise into hills. The ground gradually rises towards the centre of the peninsula, where it forms a sort of table-land about 300 feet above the level of the lakes. A large portion of the soil is fertile and well adapted for wheat, oats, barley, flax, and pasturage. It also comprises a large extent of prairie land, contains a great variety of forest trees, and abounds in aquatic fowls, game, and fish. The north-western portion of Michigan is much more elevated than the peninsular part. Mountains and plains, lakes and rivers, extend over it in a great variety of forms. Much of it is covered with forests. Michigan is rich in minerals, especially copper—a solid mass of which, upwards of 4 tons weight, has been raised from one of the mines. The other minerals comprise iron, lead, coal, gypsum, limestone, and marl, besides sand of excellent quality for the manufacture of glass wares.

**Rivers and Lakes.**—As the rivers of the peninsula descend from the table-land to the great lakes, they have a short course. On the table-land they ran slowly, but on the declivity their flow is accelerated and interrupted by rapids. The rivers St. Clair and Detroit, as well as the lakes of Huron, St. Clair, and Erie, are noticed under CANADA. About forty considerable rivers and a great number of small streams discharge their waters into the three lakes which constitute part of the boundary of the north-western portion of Michigan, so that the state is well watered. It has altogether upwards of 1000 miles of coast. The climate is severe. The winter generally begins in the middle of November and lasts to the middle of March.

**Productions and Trade.**—Wheat, maize, oats, and potatoes are grown to a great extent. There also exists a good trade in wool, apples, maple sugar, and all kinds of live stock. The principal manufactures carried on are woollens, cottons, and flour. There are also iron forges and furnaces, tanneries, breweries, and distilleries. A ship canal round the rapids of St. Mary's Strait connects Lakes Superior and Huron, and four or five trunk lines of railway, about 1200 miles in all, facilitate communication with the chief towns and neighbouring countries. Vast quantities of pine lumber are exported from the northern half of the state.

**History.**—Early in the seventeenth century the French penetrated into this country from Quebec, and in 1670 they founded Detroit. In 1788 Michigan was included in the limits of the United States, but was not given up by the British till 1796. It was constituted a territory in 1805, and was made a state in 1836.

**MICHIGAN LAKE**, is one of the five great lakes of North America, having an area of 20,000 square miles; its greatest breadth is 108 miles, its length 320 miles, and average depth 1000 feet. It lies wholly within the United States territory, being inclosed by Indiana, Illinois, Wisconsin, and Michigan. The Strait of Mackinaw, on the north-east, communicates with Lake Huron; there are few inlets; and on the western side are situated the towns of Chicago, Milwaukee, and Sheboygan.

**MI'CROCLINE**, a variety of felspar allied to orthoclase in chemical composition, but crystallizing in the triclinic system. The basal cleavage is chequered, and often there is a bluish play of colours. It occurs in many of the granites in porphyritic crystals associated with orthoclase and albite.

**MI'CROCOSM** and **MAC'ROCOSM**, terms used by the mystic philosophers of the sixteenth century to designate the world of man and the external universe. The "great world," or macrocosm, was considered as being a human organism on a colossal scale, and man as being a microcosm, "little world," or an epitome of everything in nature. Paracelsus made great use of this theory in his attempted reform of the system of medicine, and he seems to have taught that the physician should study all parts of external nature in order that he might know how to deal with disease in man. Goethe in the opening scene of "Faust" makes a brilliant use of the two signs, and it is as a result of his meditation on the sign of the microcosm that Faust is led to summon the Earth-spirit to his aid.

**MICROCOSMIC SALT**, or *Phosphate of Soda and Ammonia* ( $\text{NH}_4\text{NaHPO}_4\cdot 4\text{H}_2\text{O}$ ) is a fusible salt much used as a flux instead of borax in blowpipe experiments.

**MICROCRYSTALLINE** is the term applied in lithology to the structure of certain rocks that, to the unaided eye, appear compact and homogeneous, but, under the microscope, are shown to be composed of an aggregation of minute crystals.

*Microfossils* is the term applied to the isotropic granular basis found making up the ground mass of many partially devitrified rocks.

**MICROFARAD**, the working practical unit of *electrical capacity*, the theoretical unit being the *farad* (named after Faraday). A condenser of one-farad capacity would be raised to a potential of one VOLT by a charge of one WEBER, and would be therefore of large size. A *microfarad* is a millionth of a farad, and even this represents the capacity of 8 miles of the largest Atlantic cable, or of 8600 square inches of tinfoil.

**MI'CROLITES** are the minute crystals, in an imperfect state of development, found in many eruptive rocks not wholly crystalline. They mark the growth of crystals, being one of the stages in the devitrification or passage from a glassy to a crystalline condition of these rocks. Two distinct kinds are recognizable—trichites, which are light coloured; and helonites, dark coloured or opaque.

**MICROMETER** is the term generally applied to instruments for measuring small spaces or angles with great accuracy or convenience. The principal is the Spider-thread Micrometer of Gascoigne (1640), which generally consists, as now used, of two fine wires or spider's threads, of which one is fixed and the other movable, placed in the eye-tube of a telescope at the focus or place where the image is formed. The movable thread is in a sliding plate, which is moved parallel to the other and perpendicularly to the axis of the telescope, by a graduated milled head-screw, till the object appears to be comprehended between the threads; and a graduated scale is provided for the measurement of the space. Or instead of spider's threads fine ruled lines upon the glass are used; and also instead of working by parallel movement, one line is made to meet the other at an angle, and the object is by adjustment made to be comprised between the legs of the angle.

*Circular Micrometer*.—This was suggested by Boacovich (1740), and brought into form for use by Lacaille (1742). Fraunhofer's form of annular micrometer is a steel opening ring in the centre of a plate of glass, determining the position of a heavenly object by the time it takes to pass across the ring and the path it follows in so doing.

*Double-image Micrometers*.—The first of these was suggested by Komer (1678), and brought into use by Bouguer (1748). This depends upon the double refraction of Iceland spar, two crystals being so cut as to give the greatest deviation to the two images, and the space through which the apparatus has to move before the two images coincide to form one, gives, as interpreted by the accompanying graduation, the diameter of the object. Another form is a divided lens inserted in the eye-piece, one-half being movable parallel to the life of division by a graduated screw. The image being first seen clear of distortion, the movable half-lens is then adjusted to the right or left, carrying, of course, its half-image with it until the inner limb of its half-image coincides with the outer limb of the half-image in the fixed portion. It is manifest that the half-lens has moved the distance of the image to the right or left, and this is then read off on the graduation.

The *Diptric Micrometer*, invented by Ramsden (1777), consists in its latest form, as applied to the measurement and scaling of objects magnified in the microscope, of a small diamond-ruled glass plate, with lines 100 to a millimetre (that is, about 2500 to an inch), placed in front of the object-glass so that the enlarged image of the micrometer lines is received together with the equally enlarged image of the object by the eye-piece. By means of a transparent glass held at the angle of 45 degrees, the magnified image, with the portion of the micrometer scale which it covers, is viewed reflected in the glass at the same time as a millimetre scale seen through the glass. Then if the enlarged image reflected in the plate of glass is found to cover seventeen lines of the enlarged micrometer scale, it is evident that the true size of the object is seventeen-hundredths of a millimetre wide. Now if on looking through the glass the enlarged image is seen to cover 51 millimetres, it is plain that it has been enlarged just 300 diameters, since that which is in reality seventeen-hundredths of a millimetre now appears to be 5100-hundredths of a millimetre, i.e. 51 millimetres in diameter.

The *VERNIER*, elsewhere described, is after all a sort of micrometer, and so is every graduated milled screw. For let the turns of the thread of such a screw be a line (a twelfth of an inch) apart, then the screw advances one line at every revolution. Let it be graduated into a hundred parts, then as it is turned it advances for every mark of graduation one-hundredth of a line, and its advance is known to that nicety.

**MICROPHONE**, an instrument for augmenting weak sounds. It was a direct offshoot from the telephone, and will, perhaps, be somewhat better understood by a reference to *TASIMETER*, where the remarkable effects produced by a variation of *pressure* upon a conducting medium is shown. The peculiarities of the microphone are the result of molecular action produced in the conducting medium itself. Professor Hughes found, after many experiments, that certain substances placed at the point of contact of wires through which an electric current is passed, intensify, to a surprising degree, sounds made within the circuit or in proximity. These substances may be iron filings, metallic powders, pieces of gas carbon or metallized carbon stick—that is, a stick of carbon which, when red hot, has been dipped in mercury, and made to imbibe particles of that metal in its pores. It is found that if contact in an electric wire be suddenly broken and as suddenly renewed, a tick or snap is heard each time; but if the breaking or remaking are gradual, the tick is preceded by a preliminary murmur or grating. Every kind of dragging or stretch-

ing, squeezing or compressing, before actual rupture, tends to produce this murmur. Professor Hughes filled a glass tube with some pieces of gas carbon, together with powder of tin and zinc, plugged the ends with carbon, attached wires from a battery, and a most highly sensitive conductor was produced. The reason is obvious. Passing through a continuous and uninterrupted length of copper wire, the current would have one unvarying homogeneous medium; but with the glass tube in question interposed, the current passed through a kind of intermittent medium; its various portions were connected, it is true, or the current would not pass at all; but owing to the mobility of all the various particles within the tube, molecular action is set up of exactly the same nature as that which causes the ticking, snapping, or grating at the rapid breaking, reconnecting, or dragging of an electric wire. The metallized carbon stick answers the same purpose as the varying substances in a glass tube.

Place a sounding board in proper relation to such a microphone, and not only is articulate sound and speech taken up and transmitted to a distant station with great power and distinctness, but the minutest possible vibrations are detected and converted into loud noises. The slightest stroke or the lightest touch given to the sounding-board is sufficient to produce a loud grating; the gentle stroke of a camel's-hair pencil is recorded as a rustling sound; while the very footfalls of a little common house-fly, as it walks across the board, are distinctly heard by a person whose ear is at the telephone, it may be miles away.

For practical utility there is a wide field for this ingenious invention. Even in the first year of its invention (1878), Sir Henry Thompson demonstrated its value for discovering the existence of stone in the bladder; however small the particle might be; and a hidden bullet in a wound might be discovered in the same way. Being more delicate than the stethoscope or sphygmograph, it may be so adapted as to excel them in detecting the sounds and movements of the lungs and heart.

**MICROSCOPE**, the name of an instrument for enabling the eye to see distinctly objects which are placed at a very short distance from it, or to see magnified images of small objects, and therefore to see smaller objects than would otherwise be visible. The name is derived from the two Greek words *mikros*, small, and *skopeo*, I see. Spectacles are magnifying glasses to the aged, whom they enable to see as closely to their objects as the young, and therefore to see the objects larger than they could themselves otherwise see them distinctly, but not larger than they are seen by the unassisted younger eye.

In saying that an object appears larger at one time, or to one person, than another, it is necessary to guard against misconception. By the apparent size of an object we mean the angle it subtends at the eye, or the angle formed by two lines drawn from the centre of the eye to the extremities of the object. In fig. 1 the lines  $A\ E$  and  $B\ E$  drawn

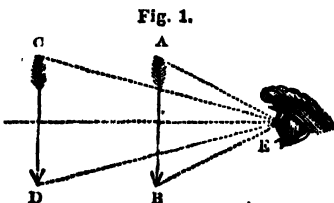


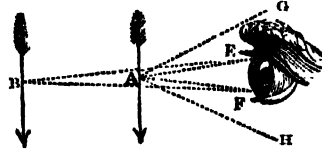
Fig. 1.

from the arrow to the eye form the angle  $A\ E\ D$ , which, in the case of angles of small magnitude, is nearly quite as great as the angle  $C\ E\ B$  formed by lines drawn from a

similar arrow at twice the distance. The arrow  $A\ B$  will therefore appear nearly twice as long as  $C\ D$ , being seen under twice the angle, and in the same proportion for any greater or lesser difference in distance. The angle in question is called the angle of vision, or the visual angle.

The angle of vision must, however, not be confounded with the angle of the pencil of light by which an object is seen, and which is explained in fig. 2. Here we have

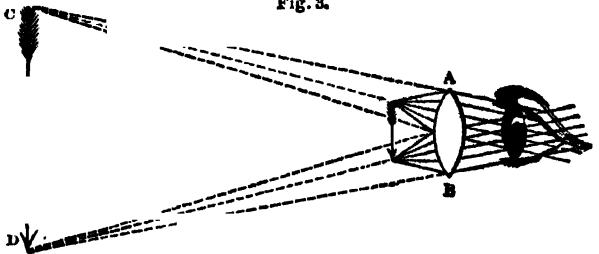
Fig. 2.



drawn two arrows placed in relation to the eye as before, and from the centre of each have drawn lines exhibiting the quantity of light which each point will send into the eye at the respective distances.

Now, if  $E\ F$  represent the diameter of the pupil, the angle  $E\ A\ F$  shows the size of the cone or pencil of light which enters the eye from the point  $A$ , and in like manner the angle  $E\ B\ F$  is that of the pencil emanating from  $B$ , and entering the eye. Then, since for small angles, as has been said,  $E\ A\ F$  is roughly double  $E\ B\ F$ , it is evident that  $A$  is seen by four times the quantity of light which could be received from an equally illuminated point at  $B$ , so that the nearer body would appear brighter if it did not appear larger; but as its apparent area is increased four times, as well as its light, no difference in this respect is discovered. But if we could find means to send into the eye a larger pencil

Fig. 3.



of light, as for instance that shown by the lines  $C\ A\ H$ , without increasing the apparent size in the same proportion, it is evident that we should obtain a benefit totally distinct from that of increased magnitude, and one which is in some cases of even more importance than size in developing the structure of what we wish to examine. This is sometimes done.

**Simple Microscope.**—The magnifying power of a single lens depends upon its focal length, the object being, in fact, placed nearly in its principal focus, or so that the light which diverges from each point may, after refraction by the lens, proceed in parallel lines to the eye, or as nearly so as is requisite for distinct vision. In fig. 3,  $A\ B$  is a double convex lens, near which is a small arrow to represent the object under examination, and the cones drawn from its extremities are portions of the rays of light diverging from those points and falling upon the lens. These rays, if suffered to fall at once upon the pupil, would be too divergent to permit their being brought to a focus upon the retina by the optical arrangements of the eye. But, being first passed through the lens, they are bent into nearly parallel lines, or into lines diverging from some points within the limits of distinct vision, as from  $C$  and  $D$ . Thus altered, the eye receives them precisely as if they

really emanated from a larger arrow placed at *C* *D*, which we may suppose to be 10 inches from the eye, and then the difference between the real and the imaginary arrow is called the magnifying power of the lens in question.

From what has been said, it will be evident that two persons, whose eyes differed as to the distance at which they obtain distinct vision, would give different results as to the magnifying power of a lens. To one who can see distinctly with the naked eye at a distance of 5 inches, the magnifying power would seem, and would indeed be, only half what we have assumed. Such instances are, however, rare; the focal length of the eye usually ranges from 6 to 12 or 14 inches, so that the distance we first assumed of 10 inches is very near the true average, and is a convenient number, inasmuch as a cipher added to the denominator of the fraction which expresses the focal length of a lens gives its magnifying power. Thus a lens whose focal length is one-sixteenth of an inch is said to magnify 160 times. This magnification must be understood to be *linear magnification*, or the increase in apparent diameter; the superficial increase is of course the square of this. Magnification is, however, always reckoned by multiples of the diameter.

Referring to fig. 3, it will be observed that if the eye could see the small arrow at the distance there shown without the intervention of the lens, only a very small portion of the cones of light drawn from its extremities would enter the pupil; whereas we have supposed, for the sake of simplicity, that after being bent by the lens the whole of this light enters the eye as part of the cones of the smaller angle whose summits are at *C* and *D*. But so large a pencil of light passing through a single lens would be distorted by the spherical figure of the lens, and by the chromatic dispersion of the glass, and would produce a very confused and imperfect image. This confusion may be greatly diminished by reducing the pencil; for instance, by applying a stop, as it is called, to the lens, allowing the undistorted central rays to pass through an aperture, and stopping the distorted rays at the circumference of the pencil by an opaque annular rim. But if we gain distinctness with a narrow aperture we lose light; on the other hand, if we use a wide stop or no stop we get plenty of light, but an indistinct and confused image. It becomes therefore a most important problem to reconcile a large aperture with distinctness, or, as it is called, *definition*; and this has been done in a considerable degree by effecting the required amount of refraction through two or more lenses instead of one, thus reducing the angles of incidence and refraction, and producing other effects which will be shortly noticed. This was first accomplished in a satisfactory manner by Wollaston's Doublet, two plano-convex lenses having their focal lengths in the proportion of 1 to 8, or nearly so, and placed at a distance which can be ascertained best by actual experiment. Their plane sides are placed towards the object, and the lens of shortest focal length next the object. This doublet requires a nice adjustment of the stop in order to render it of any value.

The next step in the improvement of the simple microscope was made by Holland, and it consists (as shown in fig. 4) in substituting two lenses for the first in the doublet, and retaining the stop between them and the third. The first bending, being thus effected by two lenses instead of one, is accompanied by smaller aberrations, which are therefore more completely balanced

or corrected at the second bending, in the opposite direction, by the third lens. This combination, though called a triplet, is essentially a doublet, in which the anterior lens is divided into two. For it must be recollected that the first pair of lenses merely accomplished what might have been done, though with less precision, by one; but the two lenses of the doublet are opposed to each other; the second diminishing

the magnifying power of the first. The two first lenses in the triplet concur in producing a certain amount of magnifying power, which is diminished in quantity and corrected as to aberration at the third lens by the change in relation to the position of the axis which takes place in the pencil between what is virtually the first and second lens. In this combination the errors are still further reduced by the close approximation to the object, which causes the refractions to take place near the axis. Thus the transmission of a still larger angular pencil—namely, 65 degrees, is rendered compatible with distinctness, and a more intense image is presented to the eye. Every increase in the number of lenses is attended with one drawback, from the circumstance that a certain portion of light is lost by reflection and absorption each time that the ray enters a new medium.

Another very useful form of simple microscope was proposed by Dr. Wollaston, and called by him the *Periscopic Lens*. It consisted of two hemispherical lenses, cemented together by their plane faces, having a stop between them to limit the aperture. A similar proposal was made by Mr. Coddington, who, however, executed the project in a better manner, by cutting a groove in a whole sphere, and filling the groove with opaque matter. This is the well-known Coddington Lens.

The *Compound Microscope* may consist of only two lenses, while a simple microscope has been shown to contain sometimes three. But in the compound microscope the two lenses have totally different functions; the first (the *object-glass*) receives the rays from the object, and bringing them to new foci, forms an image, which the second (the *eye-glass*) treats as an original object, and magnifies it just as the single microscope magnified the object itself.

By a pre-arrangement of the relative proportions in which the magnifying power shall be divided between the object-glass and the eye-glass, any given distance (within certain limits) between the first and its object may be secured. This is one valuable peculiarity of the compound instrument; and another is the large field, or large angle of view, which may be obtained, every part of which will be nearly equally good; whereas with the best simple microscopes the field is small, and is good only in the centre. The field of the compound instrument is further increased by using two glasses at the eye-end; the first being called, from its purpose, the *field-glass*, and the two constituting what is called the eye-piece.

The construction of achromatic object-glasses, made up of mutually corrective lenses [see LENSES] by means of which the light comes uncoloured to the eye, has been brought to such perfection that the compound microscope now holds a very high rank among scientific implements, while the transcendent beauties of form, colour, and organization which it reveals to us in the minute works of nature, render it subservient to the most delightful and instructive pursuits. The great usefulness of the microscope has recently been still further developed by an apparatus discovered in 1870, which increases its power and capability of definition to an almost incredible degree. It was invented by Dr. Royston Pigott, and is called an "aplanatic searcher." Objects which, under the best ordinary microscopes, appear as black patches, with it are seen to be full of beads, or lines, or grooves, or other definite structure.

The *Solar Microscope* consists of a conical tube fixed by its base to a frame of wood, which is screwed to a closed window-shutter, at an aperture purposely made in the shutter; the tube projects into the room, which, when the observations are to be made, is rendered quite dark, and is sometimes lined with black cloth. The magnifying power is produced by a system of lenses contained in the tube, as in other microscopes. On the exterior of the window is a frame carrying a rectangular mirror, so jointed

Fig. 4.



as to become adjustable in any direction, so as to permit the rays of the sun, whatever be the position of the latter, to be reflected into the tube. When the object is transparent, the rays of solar light are allowed to pass from the mirror directly through the lenses to the screen; but when it is opaque, a convex lens placed at the aperture in the window-shutter causes the solar rays to be condensed on a small mirror placed in a box at that end of the instrument which is within the room, and from this mirror the rays are reflected to the object. The condensed light thus thrown on the object diverges from thence, and passes by refraction through the system of lenses in which the magnifying power is produced to the screen.

The solar microscope is now superseded by the *Oxy-hydrogen Microscope* for purposes of public demonstration. Here the illuminating power is the powerful and steady **LIME LIGHT**, formed by a ball of lime heated to whiteness by a flame of hydrogen, intensified by a jet of oxygen. The **ELECTRIC LIGHT** is also often used as the light-source.

**MICROSCOPIUM** (the Microscope), a constellation of Lacaille, situated above *Grus* and *Indus*, at the junction of *Capricornus* and *Sagittarius*.

**MIDAS**, the son of Gordios, king of Phrygia, by the goddess Kubelê (Lat. *Cybele*), according to the Greek legend, was trained by Orpheus, and favoured by the god Dionusos (Lat. *Bacchus*). Seilênos, the drunken companion of Dionusos, once strayed in a fit of drunkenness into the lands of Midas and was arrested in a riotous state. Midas restored him with all kindness to Dionusos, who gratefully granted him anything he might wish. Midas absurdly asked that all he touched might turn to gold. His avarice was terribly punished, for the clothes he wore, the water he wished to bathe in, the food he sought to eat, and the wine he raised to his lips became solid gold as he touched them. In this extremity he implored the god to release him from the consequences of his wicked wish. Dionusos permitted him to wash off the golden curse in the river Paktôlos (Lat. *Pactolus*), whose sands ever after bore golden grains.

Midas was rash enough to act as judge between Apollo and Pan, and foolish enough to prefer Pan's pipes to Apollo's lyre. The angry god of music rewarded him with a pair of asses' ears, which Midas concealed for shame under the Phrygian cap. His body-servant discovered the secret, and burned with a desire to tell it; but knowing that to betray the king would cause his death, he whispered it among the reeds by the river. But the reeds could not keep the secret, and rustled in the wind so that their rustling seemed to say, "Midas has asses' ears."

**MIDAS** is a genus of South American monkeys belonging to the family Hapalidæ or Marmosetæ. One of the best known is the Silky Tamarin (*Midas marikina*), which is noticed under the heading **MARMOSET**.

**MIDDELBURG** is a town of the Netherlands, the capital of the province of Zeeland, 4 miles north-east of Flushing, near the centre of the island of Walcheren. It is inclosed by a bastioned mound and a ditch, and partly intersected by canals, one of which forms a small harbour; and it has an abbey church, Latin school, an ancient and handsome town-house, school of design, public library, manufactures of starch, glass, and paper, salt refineries, saw mills, and powder manufactory, and an active import trade in wine and export in corn. Middelburg is the finest city of the northern provinces, and many of its inhabitants are wealthy. It was the birthplace of Zach. Janssen, and Hans Lipperhey, the inventors of the telescope (about 1610). The town is connected with Flushing by means of a canal, and a large dock was completed in 1876. The population is about 18,000.

**MIDDLE AGES** or **MEDIEVAL PERIOD**, a space of time not very closely defined by historians, but

which is usually taken as comprising the ten centuries following the overthrow of the Western Roman Empire in 476, ending with the period of the Renaissance. The term *Dark Ages* is sometimes applied to the first half of this period on account of the decline in civilization which followed the downfall of the Roman Empire. It must be remembered, however, that the old civilization of the empire had become corrupt and abominable in many respects, and though the victories of the "barbarians" were attended by much desolation and misery, their conquest marks the beginning of a fresh social and political life, vastly superior to that which it succeeded. During the middle ages the different nations of Europe were formed, the Mohammedan Empire arose, flourished, and declined, the papacy attained its most flourishing condition, and the hierarchy acquired its highest wealth and power. By the labours of energetic missionaries the pagan nations of Northern Europe were converted to Christianity in the early portion of this period, and the monastic institutions they founded served to keep the flame of learning alive through the trying times of the fifth and sixth centuries. During the middle ages chivalry and the feudal system arose, impressing their influence on every civilized country, and the religious enthusiasm of the time manifested itself in pilgrimages, in the Crusades, in the establishment of monasteries, and in the erection of magnificent ecclesiastical buildings. The great writers of the period were chiefly theologians and philosophers, generally combining the two. The scholastic philosophy of the middle ages has been unjustly depreciated by many historians, but notwithstanding all the waste of intellectual labour by which it was characterized, it contains a vast amount of genuine thought, and it is now perceived that in spite of their conclusions the influence of the schoolmen was unmistakably on the side of religious liberty. The discoveries of gunpowder, the mariner's compass, cheap paper, and the printing press, were all powerful influences in preparing the way for the Renaissance; and with the revival of letters, the increase of knowledge, and the civil and religious liberty which followed these important events, a new era began, the developments of which are still being worked out at the present day.

See Hallam, "History of the Middle Ages;" Guizot's "Histoire de la Civilization;" Ruckert's "Geschichte des Mittelalters" (Stuttg., 1858); and Dr. L. Schmitz's "History of the Middle Ages" (Edinburgh, 1859).

**MIDDLE POINTED STYLE** of Gothic architecture, another name for the *Decorated Gothic* of England, whose finest period is from 1307 to 1377, and its purest type the Lady Chapel at Ely. See **GOTHIC ARCHITECTURE**.

**MIDDLE TEMPLE**, one of the four English Inns of Court having the exclusive privilege of calling persons to the bar. See **INNS OF COURT**.

**MIDDLE VOICE** is a term employed in Greek grammar to indicate a class of verbs which are called reflective in some other languages. The reflective meaning is supposed to be the original signification of the middle voice, but it is difficult in many of the middle verbs in Greek to trace the reflective notion. Although a distinct mode of conjugation has been assigned to verbs with a middle signification, there are only two tenses in the Greek middle voice which really invariably possess a reflective meaning—namely, the first and second aorists in *-σαμην* and *-σμεν*; which in *ἐστίν*, the model verb, are *ἐνσφύεσθαι* and *ἐνσφύεσθαι*. The future in *-σομαι* (*ἐνσφύεσθαι*, *ἀντι-σομαι*), which is called in most grammars the future middle, has, for instance, a passive signification as well as a middle.

**MIDDLESBOROUGH**, a municipal and parliamentary borough and port in Yorkshire, on the Tees, 8½ miles E.N.E. of Stockton, with which it is connected by railway, and 238 miles from London by rail. The town presents the most remarkable instance of rapid growth in the United Kingdom. In 1829 its site was occupied by a



solitary farm-house, but some persons interested in the Stockton and Darlington Railway—then in course of construction—and in the neighbouring collieries, seeing that the place afforded a more favourable site for loading colliers than Stockton, purchased land and laid out a town and port. In 1841 the population numbered 5463; in 1851, 7431; and in 1881, the fiftieth year or jubilee, postponed from 1880, was celebrated of a populous and important industrial town of 55,984 inhabitants. It was in 1851 that a new source of prosperity was opened up, in the shape of some very remunerative iron mines, in the Cleveland Hills, a range running parallel to the Tees, 4 or 5 miles from Middlesbrough. These iron mines have become among the most extensive in the world, with an annual output of about 6,000,000 tons. The ore contains about 83 per cent. of pure metal, but the latter is of inferior quality to that of some other districts, and richer ores are therefore generally brought and mixed with it. The quantity of phosphorus and other vitiating elements for long prevented the profitable employment of the ores of the vicinity in making steel, but improved methods of dealing with them have overcome the difficulty. Besides its immense smelting iron and steel works, there are iron shipbuilding yards, engine and machine works, chemical and bottle works, and potteries. The coal trade, although surpassed by that of iron, is still extensive. In 1870 another industry was furnished by the discovery of immense deposits of rock-salt in the lower part of the Tees valley. The docks are about 12 acres in extent. The number of vessels registered as belonging to the port in 1888 was 100 (35,000 tons). The entries and clearances each average 8100 (1,200,000 tons) per annum.

A public park, 72 acres in extent, and prettily laid out, was presented to the town in 1868 by Mr. Bolckow, the proprietor of the largest ironworks, and the first mayor and M.P. of the borough. The streets are regularly laid out, crossing each other at right angles. There are five churches, a Roman Catholic cathedral, chapels, and places of worship for Wesleyans, Congregationalists, Baptists, Presbyterians, and Unitarians, a spacious town-hall, a very handsome exchange, in which the weekly iron-market is held; infirmary, literary and philosophical institute, mechanics' institute, &c. In 1877 a High School was presented to the town by J. W. Pease, M.P. It forms a valuable addition to its architecture.

Middlesbrough is situated on the southern bank of the river, 7 miles from the sea and 3 from Marton, the birth-place of the famous circumnavigator Captain Cook. There is no mention made of Middlesbrough in William the Conqueror's Domesday Book, made up in 1086. The first allusion to it anywhere occurs, according to Benton, in the reign of Henry I. (twelfth century), when Robert de Brus gave divers lands here, with the cell or chapel, to the Abbey of Whitby, on condition that the abbey should cause some Benedictine monks of their house always to reside there. This grant was made in 1130. About 1660 the Church of St. Hilda was demolished, and seventy years after a faculty was granted for building a church at Newport out of the ruins of Middlesbrough Church. A new church, dedicated to St. Hilda, was erected in Middlesbrough on the site of the ancient chapel in 1838.

Middlesbrough was made a municipal borough in 1853, and a parliamentary one, returning one member, by the Reform Act of 1867. It is governed by ten aldermen and thirty councillors, including the mayor.

**MIDDLESEX**, the metropolitan county of England, is bounded north by Hertfordshire, east by Essex, south-east by Kent, south by Surrey, and south-west by Buckinghamshire. Next to Rutland it is the smallest of the English counties. Its greatest length, north-east to south-west, is 28 miles; its greatest breadth, at right angles to the length, is 17 miles. The area is 288 square miles,

or 181,817 acres. The population in 1881 numbered 2,920,485.

**Surface; Geological Character.**—The surface of the county consists for the most part of gentle undulations, affording a sufficient slope for the purposes of drainage. A range of hills extends along the Hertfordshire border, averaging 400 feet in height above the level of the Thames. Another range of hills skirts the northern side of the metropolis by Highgate and Hampstead. Harrow occupies an insulated eminence between these two ranges. That portion of the county which lies south-west of a line drawn from Brentford to Uxbridge is an almost unbroken flat, scarcely rising more than from 10 to 20 feet above the level of the Thames.

The county is chiefly occupied by the London clay. In parts of the northern and western boundary the plastic clay crops out. The high ground about Hampstead, Highgate, and Hornsey consists of Bagshot sand, a marine formation of great depth covering the London clay. The thickness of the latter varies from about 40 feet to 250 feet. The soil is naturally poor, with the exception of a tract along the banks of the Thames which consists of a good fertile loam; but with high farming and the adoption of the very best modes of cultivation, almost every available acre is made as productive as possible. There is an annual decrease in the area under crops in consequence of the unceasing growth of the metropolis and the absorption of fields by railway extensions. Several thousand acres are devoted to market-gardens for the supply of London.

The county belongs entirely to the basin of the THAMES, which forms its southern boundary. The Lea forms the eastern boundary of the county, which it touches below Waltham Abbey, whence it flows south and south-east 14 miles to its junction with the Thames. At Waltham Abbey and at Lea Bridge the river is divided into channels, and there are some navigable cuts connected with it. There are several mills on those channels of the Lea which are not used for navigation. The Colne forms the western boundary of the county. It first touches the border below Rickmansworth, and its waters, like those of the Lea, frequently flow in several channels. It runs south about 18 miles to its junction with the Thames above Staines. It is not navigable, but is useful in turning a number of mills. The Brent rises just within the northern border of the county, and after crossing a corner of Hertfordshire, flows by a very circuitous course into the Thames. Except in some part of its lower course, where it forms part of the line of the Grand Junction Canal, this river is useless for purposes of navigation. The Cran rises between Harrow and Pinner, and after a very circuitous course of 19 or 20 miles joins the Thames at Isleworth. The principal canal is the Grand Junction, which enters the county near Harefield, in the north-west corner, and after a course of about 18 miles joins the Thames near Brentford. The Regent's Canal commences in the Paddington branch of the Grand Junction Canal, and passes along the north and east sides of the metropolis to the Thames at Limehouse. Its length is 8½ miles. It passes under Islington and the New River by a tunnel.

**History.**—In the earliest period of history this part of the island was comprehended in the domains of the Trinobantes, who occupied Essex. It was probably traversed by Cæsar in his second expedition into Britain (B.C. 54), after he had crossed the Thames. It fell under the Roman dominion in the time of Claudius, but was overrun by the Britons in the general revolt under BOADICÆA.

In the Saxon division of the island it is generally considered to have been a part of the kingdom of East Saxons, under the name of Middel Sexe, as standing between it and Wessex.

In the wars of the Saxon princes against the Danes London was repeatedly taken by that people; but the

subsequent history of Middlesex has nothing of much importance distinct from that of the metropolis.

**MIDDLETON, SIR HUGH**, was the sixth son of Richard Middleton, Esq., governor of Denbigh Castle. The date of his birth is unknown, and nothing has been recorded of his life previous to his great undertaking of forming the New River and bringing it to London, except that he was a goldsmith in the metropolis, and had realized a large property by the working of some copper mines in Wales. In 1606 he offered to bring a sufficient supply of water to London at his own cost. He fixed on the Chadwell and Amwell springs, near Ware, in Hertfordshire, as the sources out of which his New River was to be formed; and on 20th April, 1608, he commenced his work. The distance from London by the road is about 20 miles, but the whole course of the river is 37 miles. The difficulties and opposition of various kinds which he had to contend with, rendered it impossible to complete the work in the stipulated four years, and Middleton was granted an extension of time. Soon afterwards, however, he found that his private wealth was entirely exhausted. He applied in vain to his fellow-citizens for assistance. He then solicited the king, James I., who, 2nd May, 1612, entered into a covenant with Middleton, by which he engaged to pay half the expense, past and future, on condition of being entitled to half the property. The work was now pushed forward with increased vigour, and on 29th September, 1613, five years and five months from the commencement of the undertaking, the stream was admitted into the reservoir prepared for it at Sadler's Wells, near Pentonville. The whole expense of the work was about £500,000. Middleton was knighted soon afterwards, but for eighteen years after the completion of his undertaking no dividend was returned, and in the nineteenth year the first dividend only amounted to £11 19s. 1d. on each share.

Sir Hugh Middleton was compelled to sell his shares, and to support himself by the profession of what is now called a civil engineer. On 19th October, 1622, he was created a baronet, and the usual fine was remitted.

In 1636 Charles I. re-granted to Sir Hugh the whole of King James' shares, for an annual rent of £500. Middleton is supposed to have died soon afterwards, leaving a family in very indifferent circumstances. A handsome statue to his memory has been erected at Islington Green, London.

**MIDDLETON, THOMAS**, one of the best of the later Elizabethan dramatists after Beaumont and Fletcher, was born in 1570, and died in 1627, writing therefore far more under James I. than under the great queen. He was of good birth, and by profession was a barrister of Gray's Inn. He published a paraphrase of the wisdom of Solomon in 1597, and some satires in 1599. His first play, written in conjunction with Rowley, was "The Old Law" (1599); and he afterwards produced "Randall, Earl of Chester," the "Two Harpies," "A Mad World, my Masters," and "Blurt, Master Constable," and helped Dekker in his "Roaring Girl." "The Witch," another play of Middleton's, is especially famous as having been for centuries used to furnish Shakspeare with some additional stage-business, with music, &c., in the witch scenes of "Macbeth." One of those passages is—

"Black spirits and white, red spirits and gray,  
Mingle, mingle, mingle, you that mingle may.  
Titty Tittie, keep it stiff in;  
Firedrake Puckey, make it lucky;  
Liard Robin, you must bob in.  
Round, around, around, about, about;  
All ill come running in, all good keep out."

The first two and last two lines are certainly effective; but there is no excuse for foisting them upon "Macbeth" except the stage direction, *Music and a song*, "Black spirit," &c. In another place in "Macbeth" occurs a stage direction, *Song within*, "Come away," possibly corresponding with a song which begins thus in Middleton's play. This slender excuse

cannot serve for the other interpolated passages, which are, it is almost needless to say, far below Shakspeare's level. The words of Locke's "Music to Macbeth" were compiled by Davenant, who used Middleton's rather than Shakspeare's witches; and nearly all of them are additions to the genuine text. The difference between the two sets of "weird sisters" is best given by Charles Lamb: "These are creatures to whom man or woman plotting dire mischief might resort. Those originate deeds of blood, and begin bad impulses to men: from the moment that they meet with Macbeth he is spell-bound. These witches hurt the body; those have power over the soul" ("Specimens of English Dramatic Poets"). A fine edition of Middleton, in eight vols., was produced by A. H. Bullen in 1885.

**MIDGARD**, the "middle place," between *Utgard* (the outer place of the giants, &c.) and *Asgard* (the heavenly home of the Ases or gods) in the Norse mythology. It became the dwelling-place of man, and round about it was poured the sea, wrapping and enfolding it like a huge snake. In the last battle, and the overthrow of the world, the giants are aided by the Midgard Snake and her brother monster, the Wolf Fenris.

**MIDGE** is the common name given to species of small two-winged flies belonging to the family Chironomidae and suborder NEMOCERA. The midges both in appearance and habits present a great resemblance to GNATS. The proboscis, however, is much shorter and fleshy. The antennæ are very long and slender, strongly feathered, and composed of thirteen joints in the males; in the females they are shorter, less plumose, and with a fewer number of joints. The midges, like gnats, may be seen in spring, dancing in the air in swarms, but they are generally inoffensive to man. The larval and pupal stages are usually passed in the water. The worm known to anglers by the name of the blood-worm is the larva of one species (*Chironomus plumosus*). It lives in great numbers in the mud, for the most part under water, and is a favourite food of birds and fishes. It is also preyed upon by certain flies of its own order. The pupa is also aquatic, and has five respiratory filaments at the side of the thorax. The perfect insect (*Chironomus plumosus*) measures from one-third to half an inch in length. The genus *Chironomus* is very rich in species, 195 having been recorded as British. Some species of another genus, *Ceratopogon*, are blood-suckers in the perfect state, and terrestrial in the larval state, living in mushrooms or under the bark of trees. *Ceratopogon bipunctatus* is a common British species, about one-twelfth of an inch long.

**MIDHURST**, a market-town of England, in the county of Sussex, situated 6 miles west from Petworth, and 61 from London by the South-western Railway, on a gentle eminence on the south-east bank of the Western Rother. It contains a public hall, opened in 1882, and a small church of Perpendicular architecture, which was restored in 1881-88. The town is small, but particularly clean-looking, and the houses are well-built. Large quantities of corn are sold at its weekly markets. Midhurst was formerly a parliamentary borough, and returned two members down to 1832, and one from 1882 to 1885, when it ceased to exist as a separate borough. The ruins of Cowdray House, formerly the residence of the Montague family, which was burned down in 1798, are in Cowdray Park, near the town, on the east. Dunford House, in the neighbourhood, was the seat of Richard Cobden, where he was born in 1804. The meaning of the word *Midhurst* is Mid Wood.

**MID'IAN**. The Midianites mentioned in the Old Testament appear to have been one of the peoples of North Arabia, whom the Hebrews recognized as *klummen*, and in Gen. xxv. 1-4 the founder of the race is described as being one of the sons of Abraham by his wife Keturah (Heb. incense). They appear to have dwelt principally in the

desert north of the Arabian peninsula, and at the time of Gideon they represented a powerful Bedouin confederation, before whose ravages the Hebrews fled for refuge to the mountain caves and strongholds, and who were able to overrun the country for several years. Their defeat by the Hebrews under Gideon seems to have been a decisive one, and with it their recorded history comes to a close. The Land of Midian is situated on the Gulf of Akaba on the east coast of the Red Sea, and a city Madian is mentioned by Eusebius. The Arab writer Makrizi (1368-1442) gives a detailed account of this city and the surrounding country. The latter he represents as being in a state of decay, though many cities yet maintained a population. It remained unvisited by modern travellers until 1877, when Captain Burton accepted a commission from the Khedive of Egypt to explore it, in search of its supposed mineral treasures. Signs of the former existence of an abundant population were found by the expedition, and ruins of large stone-built towns, rock-cut roads, aqueducts 5 miles long, fortresses, and artificial lakes, testified to the former wealth of the district. The country must always have been rocky and barren, but each ruined town had its mining works alongside, and the travellers found that there yet remained valuable treasure in the shape of gold, silver, antimony, and tin. For an interesting account of these discoveries, see Burton's "Land of Midian Revisited" (London, 1879).

**MIDLOTHIAN.** See EDINBURGH.

**MIDNAPUR**, the chief town and administrative headquarters of a district of same name in Bengal, is situated on the north bank of the Kasai River, with a population of 32,000. The town has a large bazaar, with commodious public offices, and handsome European residences, some of them old and stately. It is healthy, dry, well supplied with water, and has some charming views in the immediate neighbourhood. An American mission maintains an excellent training school, together with a printing press, and has founded several village schools in the district. Its efforts have been particularly successful among the Santals, and some of the earliest and most valuable works on that language have issued from the Midnapur mission press. A brisk manufacture of brass and copper utensils takes place in the town; and it forms the local centre of a large indigo and silk industry. It is connected with Calcutta by a canal and by a road to Ulubaria on the Hoogly, and thence by river or road to Calcutta, 68 miles distant. The high road from Calcutta to Orissa passes through the city.

**MID'RASH** (Heb. *darosh*, to search), the name given to a voluminous series of free, poetical interpretations of Hebrew Scriptures, which deal chiefly with the spiritual feeling and emotion found in them, and are known among the Jews as the *Haggada*, in contradistinction to the authoritative interpretations of the *Halacah*. A collection of such interpretations with their illustrative stories and comments is termed Midrashim or Midrashoth. It appears probable that the first instalments of these comments must have been prepared soon after the Babylonian captivity, and as the rule of the Rabbis, by which the traditional law might not be written, did not extend to the traditions of the Midrash, there is reason to believe that some of them were committed to writing as early at least as the second century of the Christian era. From time to time fresh collections were made, and the great Midrash Rabbah, which included the Pentateuch, Ruth, Esther, the Song of Solomon, Ecclesiastes, and Lamentations, was compiled, according to some accounts, in the seventh century, though others assign it to the fifth. The Yalkut, compiled by Rabbi Shimeon in the eleventh century, was the first work of the kind which extended to the whole of the Scriptures. The major portion of this great work was printed at different times during the sixteenth century (Venice, 1517; Salonika, 1521 and 1526-27),

and an English translation with notes is now in course of preparation, one instalment of which, "The Yalkut on Zechariah" by E. G. King, B.D., appeared in 1882. See also HAGGADA, HALACAH, MISHNA, and TALMUD.

**MID'SHIPMEN**, in the royal navy, are subordinate officers on board a ship of war. By the admiralty regulations of 1870 they must, after due examination, serve two years on board a training-ship as naval cadets, after which they are transferred to a sea-going ship. Cadets taking a first-class are immediately rated as midshipmen; but others have to serve from three to twelve months, according to their class, before taking rank. No officer can pass as lieutenant unless he has seen five years' service at least as cadet and midshipman.

**MID'SUMMER DAY**, the 24th of June, is the second of the English terms or quarter-days for the payment of rent by tenants. On the eve of the feast of the nativity of St. John the Baptist, or Midsummer Day, it was long the custom to kindle fires at midnight, sometimes upon the hills, in honour of the summer solstice. In later times these were called St. John's fires.

**MIERIS, FRANS VAN** (1635-81), one of the glories of the Dutch school of painters, was a pupil of Gerard Dou, who affectionately called him "prince of pupils." The famous "Shopwoman," at Vienna, is usually reckoned his masterpiece; but every great gallery has examples of the master, and our own National Gallery possesses a fine picture, possibly a portrait, of a "Lady in a Crimson Jacket," a replica of which is in the collection of her Majesty.

**WILLEM VAN MIERIS**, son and pupil of the above (1662-1747), painted much in the same style. A "Fish and Poultry Shop," by him, is one of the ornaments of the Dutch collection at the National Gallery.

**MIGNONETTE** (*Rexeda odorata*), a plant of the order *RESACEÆ*, is a native of the north of Africa, but its delicious fragrance has caused it to be cultivated all over the world. It is naturally an herb, but when trained in the greenhouse it becomes shrubby. It has lanceolate, entire, or trifid leaves, and a six-parted calyx equal in length to the petals; the capsules are three-toothed. It is an annual or a perennial, according to the mode of cultivation. The arborescent plant is often called "tree mignonette." It is merely the common kind trained in an erect form, and prevented from early flowering by pinching off the ends of the shoots. It may be propagated by seeds or by cuttings, which readily strike root.

**MIGRATION** is the term applied to the periodical movements of animals in large bodies, usually for the purpose of reproduction.

Among the Arthropoda land-crabs migrate, going down to the sea at the breeding season to spawn. The flights of immense numbers of locusts, butterflies, and other insects are due, in most cases, to want of food, and are not periodical nor connected with reproduction, and therefore cannot be called migrations in the strict sense of the word. Many fishes, as the salmon, herring, and mackerel, are true migrants, moving in shoals, often to considerable distances, for the purpose of spawning. Among birds, migration is all but universal, and it is with special regard to these that the subject of migration may best be considered. It is first to be noticed that the migratory instinct, which is so wonderful in birds, is made up of two very distinct factors, the impulse to travel periodically, and a faculty of knowing the direction in which to travel. Mr. Wallace regards migration as an exaggeration of a habit common to all locomotive animals, of moving about in search of food; and his explanation of the origin of the instinct may best be given in his own words:—"Let us suppose that in any species of migratory bird, breeding can, as a rule, be only safely accomplished in a given area; and further, that during a great part of the rest of the year sufficient food cannot be obtained in that area. It will follow that those birds

which do not leave the breeding area at the proper season will suffer, and ultimately become extinct, which will also be the fate of those which do not leave the feeding area at the proper time. Now if we suppose that the two areas were (for some remote ancestor of the existing species) coincident, but by geological and climatic changes gradually diverged from each other, we can easily understand how the habit of incipient and partial migration at the proper season would at last become hereditary, and so fixed as to be what we term an instinct. It will probably be found that every gradation still exists in various parts of the world, from a complete coincidence to a complete separation of the breeding and subsistence areas." Mr. Darwin's theory, though independently arrived at, is substantially the same. In this way the flights of birds over vast stretches of ocean can be explained. Supposing the land over which they passed in their annual flight to be gradually becoming submerged, the change from continuous land to an expanse of ocean would be so gradual that no one generation of birds would ever perceive any difference in the route. It is a suggestive fact that all the birds migrating southwards to Africa from Europe and Britain cross the Mediterranean either by Gibraltar or by Sicily and Malta, all three of which were at a comparatively recent period united with Africa, as the shallowness of the sea along either route shows. The question how a bird finds its way over such enormous distances is very puzzling, and cannot at present be satisfactorily answered. Some explain it by the inherited memory of the landmarks seen by generations of ancestors, but this seems invalidated by the fact that these migrations are usually performed over many miles of land and sea, and in the case of many birds by night. Others deny the instinct altogether, asserting that the migrants are led by the older birds, who have performed the journey before. It is at least certain that the instinct is not so perfect as has been supposed, and that a very large number perish every year on the journey.

The migrations of mannnals, such as whales and porpoises, antelopes, &c., are due mainly to pressure of hunger, and have no connection with the reproductive function, and no necessary periodicity. The migration of the Scandinavian *LEMMING* is due to the same cause.

**MIKANIA**, a genus of plants belonging to the order *COMPOSITÆ*. *Mikania officinalis* is a native of Brazil. It is a handsome plant, the *Coração de Jesu* of the natives. The leaves contain a bitter principle and an aromatic oil, and are used in the same way and for the same diseases as the cascarilla and cinchona barks. *Mikania Guaco* (Guaco plant) is one of the plants called Guaco in South America, and is used both internally and externally as a remedy against the bites of poisonous serpents. It is easily known from other plants by the large indigo blue spots that mark the under surface of its rough leaves. *Mikania cordifolia* is a smooth climbing plant, a native of Brazil, where it is called *Erba de Cobra*; it also is employed against the bites of snakes, and is said to effect a cure by its powerful diuretic action. The genus *Mikania* is closely allied to *Eupatorium*, differing from it in the flower-heads having only four florets; they belong to a group of plants in the order *Compositæ* the most remarkable for their activity.

**MIL'AN** (Ital. *Milano*, Ger. *Mailand*), the capital of Lombardy, stands on a vast plain between the rivers Olona and Lambro, with which it communicates by a canal called Naviglio Grande, which flows all round the original old town, of which it marks the boundary. This canal is nearly 8 miles in circumference. The modern town surrounds the old one, and extends 10 miles in circumference; it is inclosed on three sides by a wall, surrounded by broad ramparts, planted with trees, and possesses a strong castle. The population in 1882 was 321,889, not including the

military. The widest and finest streets are in the external part of the town or suburbs; those which lead to the principal gates are called Corso, and serve as fashionable promenades. The streets of the old town are mostly narrow and irregular. The Duomo, or cathedral, stands nearly in the centre. This magnificent building was begun by one of the Visconti dukes of Milan, 1386. In 1805 Napoleon caused the works to be resumed, and the tower over the dome to be added, and at the present day additions and repairs are constantly in progress. It is built of white marble, in the form of a Latin cross, the length being 477 feet, the breadth 188 feet, and the height of the dome 226 feet. The delicacy of the carved work is unrivalled. It has niches for about 5000 statues. The exterior, with its hundred spires and its thousands of statues of various sizes, looks like a forest of marble. The style of architecture is a kind of florid Italian Gothic; the west front is of a mixed style. The interior is vast and imposing, and not loaded with ornaments. There are 520 steps to ascend in order to reach a gallery which runs round the principal spire, from which there is a most splendid view of the whole Lombard plain, and of the chain of Alps which borders it in the form of a crescent on the north side. A subway connects the Duomo with the archiepiscopal palace. Among the other interesting ecclesiastical buildings are the Church of St. Eustorgio, one of the few remains of ancient Milan; the Church of St. Ambrogio, the most ancient mediæval structure in the city, and in which the emperors of Germany were crowned; the refectory of the old Dominican convent of Santa Maria della Grazia, in which is the famous "Last Supper" of Lionardo da Vinci, now dim with age and "restorations," but still one of the grandest creations of art. Milan is an archbishop's see, and there are 200 churches in the city.

Milan is a gay, thriving town; its markets are abundantly supplied. Numerous coffee-houses, splendid hotels, handsome carriages, and theatres, among which is La Scala (one of the largest opera-houses in Europe, having seats for 3600 spectators), well supplied with actors and singers, all attest the habits of a luxurious capital. But Milan is also a centre of learning, and more books are published here than in all the rest of Italy. The chief scientific and educational establishments are—the royal academy of arts and sciences, formerly the palace of the Brera, with a library of 200,000 volumes, valuable MSS., a gallery of paintings and sculptures—the former comprising several *chefs d'œuvre* of the great masters—and a rich collection of medals and coins; an astronomical and magnetic observatory and botanical garden; the Ambrosian library, the earliest public library in Europe, founded in 1609, and well known for its numerous and valuable MSS. (especially celebrated for its collection of *Palimpsests*, discovered by Cardinal Mai); the Trivulzio palace and library, the hall of the school of Athens, four gymnasia, a normal school, schools of medicine and surgery, especially that of veterinary practice; several learned societies, and the celebrated Conservatorio, or school of music.

Milan abounds with charitable institutions, which are very richly endowed. The great hospital, one of the finest in the world, has a large revenue, and contains accommodation for 2000 patients. There are also lunatic, orphan, and founding asylums, deaf-mute schools, and workhouses. The total number of hospitals is eighty-five.

Among the other noteworthy public buildings may be mentioned the royal palace, city hall, Palazzo Litta, the mint, a general loan bank, and several fine squares. The great Galleria Vittorio Emanuele, a covered promenade, or bazaar, which connects two of the busiest quarters of the city, is a very splendid structure, the erection of which was commenced in 1865, and finished in 1878.

The public gardens, the ramparts, the great parade, which occupies the site of the old citadel, and the seven-

ral avenues planted with trees which lead from the gates in various directions, afford pleasant walks and rides. The city is rich in beautiful buildings. Among the palatial residences are—the Palazzi Arcivescovile, Visconti, Annone, Finanzi, Belgioioso, and Belloni. The finest gate is the Arco della Pace, which is one of the most splendid buildings in Milan, the arch (98 feet high) being entirely faced with marble, and highly enriched in every part with reliefs and sculptures, besides statues both upon and in front of the attic. It stands at the end of the Simplon road, and was begun in 1807 by order of Napoleon I., but was not completed till 1838. There are other fine entrances to the city, among which are the Porta Tleinense, the Porta Nuova, and the Porta Orientale. Near the Arco della Pace is the Piazza d'Armi, an open space for the exercise of troops, adjoining which are extensive barracks, a large amphitheatre, occupying an oval 800 feet in length, and a modern arena for horse-racing, seated for 40,000 spectators, which can be filled with water for aquatic exhibitions; the upper platform forms a promenade, edged with acacia trees.

The manufactures of Milan comprise silks, velvets, ribbons, lace, printed cottons, carpets, jewelry, plate-glass, paper, porcelain, artificial flowers, soap, and leather; there is also a royal tobacco factory. From its position on the great routes across the Alps, and its connection by canals with the principal rivers in Italy, the city is favourably situated for trade. Lines of railway run to Venice on the east, and to all parts of Italy.

The poet Virgil studied at Milan, and it was the birth-place of many popes and eminent men. In the neighbourhood is Sinternò, the solitude to which Petrarch retired after the death of Laura. The city is 483 feet above the sea level.

**History.**—Milan, after its foundation by the Insubrian Gauls, soon rose to the position of the second city of Italy. In the time of Ausonius it ranked as the sixth city of the empire. The city, however, was sacked by Attila in 452, and its recovery from the ruin in which it was then involved was slow and partial. It received a still more fatal blow in 1162, when, by order of the Emperor Frederick I., it was razed to the ground, so that its site was only to be distinguished by its Basilica and a few churches, which still raised their spires and towers above the ruins; and its inhabitants were scattered among the adjoining villages.

This event was followed by a league of the Lombard cities in opposition to the imperial authority; and in the diet or parliament held at Pontida in 1167 it was determined to restore the Milanese to the ancient seat of their wealth and power. This was effected on the 27th of April by the combined forces of Bergamo, Brescia, Cremona, and Verona. The rise of the city, thus singularly re-established, was worthy of its pristine renown; and its successive lords, the Della Torre, the Visconti, and the Sforzas—however cruel in their personal relations and domestic rule—ably ministered to the development of its resources and the expansion of its energies, and in course of time it became a centre of military science and fashion. Europe obtained from thence not only its Milan steel, but its millinery.

After the extinction of the great Sforza family it fell, in 1585, under the power of the Emperor Charles V., who in 1540 fixed the succession of the duchy of Milan in his son, Philip II. It continued an appanage of the Spanish crown until assigned to Austria, in 1718, by the treaty of Utrecht. During the early years of Napoleon's power it was occupied by a French army (1796); and of the kingdom of Italy established by the great conqueror it was recognized as the capital. In its Duomo he placed upon his head the famous iron crown, which for several centuries had been regarded as the symbol of imperial power. In 1859, after the termination of the war between France, Italy, and Austria, Milan was ceded to Italy.

**MILDEW** is a disease which attacks both living and dead vegetable matter, and is commonly believed to be owing to fogs, dew, meteors, and noxious exhalations, but in reality is caused by the ravages of parasitical fungi. This malady is often of little importance to the subjects of its attack, as it appears towards the close of the year, when the most essential of the vital functions of plants are fulfilled, or in such a small degree as to produce no appreciable effect upon the general health of plants infested. But it very often becomes a most serious evil, destroying the straw of corn, and so preventing the maturation of the grain, ravaging the fields of pease and beans, destroying the hopes of the gardener by seizing upon his peaches and nectarines, especially when forced, and not unfrequently extending its evil influence to the orchards and every description of kitchen-garden crop.

The species of fungi which produce these effects are always very minute, and often of microscopic smallness. The most common are the following:—the clover mildew, *Peronospora trifoliorum*; onion mildew, *Peronospora Schleideniana*; radish mildew of turnips, *Oidium Balsanii*; putrefactive mildew of turnips and cabbages, *Peronospora parasitica*; grass mildew, *Erysiphe graminis*; corn mildew, *Puccinia graminis*; parsnip mildew, *Peronospora nirea*; pea mildew, *Erysiphe Martii*; lettuce mildew, *Peronospora ganquliniformis*. Information concerning these fungi and allied forms will be found in "Diseases of Field and Garden Crops," by Worthington G. Smith; and in "Microscopic Fungi," by M. C. Cooke.

**MILE.** This word is derived from Lat. *miliare*, the *mille passus*, or thousand paces, of the Romans. Each pace was 5 feet, and each foot certainly contained between 11·60 and 11·64 modern English inches. Taking the Roman foot at 11·62 English inches, the original Roman mile was therefore 1614 yards, or nine tenths and one-sixteenth of an English statute mile, very nearly; while the English mile is a Roman mile and nine-hundredths of a Roman mile. The English statute mile is 8 furlongs, each of 220 yards, or 40 poles of 5½ yards or 16½ feet each. It is also 80 surveying chains of 22 yards each. It is therefore 1760 yards or 5280 feet. The square mile is 6400 square chains or 640 acres.

The remains of the Roman mile and the Gallic or Celtic league are found in the itinerary measures of most European countries. The following list will show the itinerary measures of various countries in English yards and statute miles. We have placed them in order of magnitude.

	Yards.	Stat. miles.
Spanish mile, . . . . .	1522	·864
Ancient Roman mile, . . . . .	1614	·917
Modern Roman mile, . . . . .	1630	·926
English statute mile, . . . . .	1760	1·000
Tuscan mile, . . . . .	1809	1·027
Ancient Scottish mile, . . . . .	1977	1·123
Irish mile, . . . . .	2240	1·273
French posting league, . . . . .	4263	2·422
Spanish judicial league, . . . . .	4635	2·634
French league of 25 to the degree, . . . . .	4861	2·761
Portuguese league, . . . . .	6751	3·836
German short mile, . . . . .	6859	3·897
Flanders league, . . . . .	6864	3·900
Spanish common league, . . . . .	7416	4·214
Hanoverian mile, . . . . .	7442	4·228
Prussian mile, . . . . .	8238	4·680
Danish mile, . . . . .	8244	4·684
Dantzic mile, . . . . .	8467	4·811
Hungarian mile, . . . . .	9002	5·114
Swiss mile, . . . . .	9153	5·201
German long mile, . . . . .	10126	5·753
Swedish mile, . . . . .	11690	6·642

The metrical mile of 1000 French mètres, or 1 kilomètre, or 1094 English yards, is used among the measures of France, Italy, and the Netherlands; the geographical mile, or a sixtieth of a degree of latitude, or about 2025 yards, is used in England and Italy; the geographical league of three such miles or 6076 yards is used in England and France; the German geographical mile is 4 English geographical miles or 8101 yards; the short mile used in Poland (which is also the league of Brabant) is the geographical league (6076 yards), and the long mile of the same country is the German geographical mile (8101 yards), which is also the length of the mile in Holland. The Arabian mile is 2146 yards; the Chinese li, 609 yards; the Persian parasang, 6076 yards; the Russian verst, 1167 yards; and the Turkish berri, 1827 yards. All the preceding statements relative to modern measures rest on the authority of Kelly and Woolhouse.

**MILESIAN FABLES.** See **MILETOS**.

**MILESIANS**, the people who formed the sixth or Spanish invasion of ancient Ireland. See **IRELAND**.

**MILETOS** (Lat. *Miletus*) was one of the chief Greek cities of the ancients in Asia Minor, the southernmost of the famous twelve great Ionic towns, being situated in the territory of Karia (Lat. *Caria*), at the mouth of the Mæander. Its founder was the fabled Miletos, who led thither some Cretan fugitives flying from the stern rigour of Minos. The sheep of Miletos were famous for their fleece, and Milesian wool was the favourite staple of the Greeks. The woollen trade led to the establishment of many colonies along the shores of the Black Sea. Sinopé, Odessa, Abydos, &c., are all due to the enterprise of Miletos, as well as colonies dotted along the Mediterranean as far as the pillars of Héraklès (Gibraltar), and the flourishing Greek treaty-port of Naukratis, in the mysterious land of Egypt, otherwise long jealously closed to outer influences. The site of Naukratis was discovered in 1885 by M. Petrie. Miletos became the centre of the great revolt of the Ionic cities of Asia against the dominion of Persia, which had replaced the milder sway of Cræsus, king of Lydia (B.C. 557). In the fearful revenge which Persia took Miletos was entirely destroyed (B.C. 494). Alexander the Great destroyed it a second time, and in the modern era the all-devouring Turk destroyed it a third time, and as efficiently as usual, so that its ruins cannot be discovered.

Miletos was always a focus for literature and philosophy. Thalès, Anaximenes, and Anaximandros, the philosophers, and Kladmos and Hekataios, the historians, were its citizens. Later writers composed or imitated from the Persian the love-tales so famous as the "Milesian Fables," described by Phétois, but utterly lost to us. These were the "Arabian Nights" of the classical nations. In their Latin dress they delighted Rome, from the times of Marius onwards, as much as in the original they had charmed the world of Greece. "The Lost Tales of Miletus" has served more than once as title for a collection of stories; Bulwer Lytton so used it, among others.

**MILFORD**, a seaport of Wales, in the county of Pembroke, situated on the north side of Milford Haven, 6 miles W.N.W. of Pembroke, and 280 miles from London by rail. In 1790 the foundation of a royal dockyard seemed to promise a prosperous future for Milford, but the removal a few years later, first of the dockyard, and afterwards of the Irish Steamship Company, left it almost as insignificant as the ancient ports of Kent and Sussex, from which not only the tide of business, but the very salt water, has receded. The erection of extensive docks has, however, entirely changed the aspect of affairs. The dimensions of these docks are as follow:—Total available dock area, 60 acres; lock, 500 feet long by 70 feet wide; graving dock, which can also be used as a lock or wet dock, 710 feet long, 96 feet wide; small graving dock, 270 feet long, 46 feet wide; depth over sills, high-water

spring tides, 86 feet, and at high-water neaps, 27 feet; depth of water in docks, 28 feet. The works have been constructed by closing by a wharf wall and caissons a creek or "pill," to use the local word, that runs into the Haven, and then dredging out the inclosed area to a suitable depth.

Milford occupies a peculiarly favourable position for competing with other commercial centres, far apart from the magnificent Haven, the sea passage from America is 170 miles shorter than that to Liverpool, and trains can run alongside the steamers. The near neighbourhood of the Welsh coalfields is also an advantage.

**Milford Haven**, so often alluded to by Shakespeare in his play of "Cymbeline," is the best natural harbour in England, both in respect of area, complete shelter, and facility of entrance. Vessels seeking refuge in it need no pilot. The Haven is virtually landlocked, and the minimum depth of water at low-water spring tides is 48 feet. The population of Milford in 1881 was 8813.

**MILITARY FRONTIER** (Hungary). This was the name formerly given to a tract of country which extends from the Adriatic Sea to the Bukovina, between the frontiers of Illyria, Croatia, Slavonia, Hungary, Transylvania, and those of Turkey. The inhabitants, who were well trained and disciplined, defended their frontier against hostile attacks without pay, and in time of war served the state in the same manner as the rest of the army, and received the usual pay. By a law passed in 1869 it was decided that the administration of the Military Frontier should be gradually transferred to the Hungarian civil authorities. This was finally accomplished in 1881. [See **AUSTRIA AND HUNGARY**.] Originally established to repel the inroads of the Turks, the Military Frontier was maintained long after those inroads had ceased to be formidable. The prevention of smuggling and the exclusion of the plague from Europe served as pretexts rather than reasons for its maintenance. In fact, the military authorities at Vienna could not easily bring themselves to give up so cheap a method of maintaining in times of peace a large military force in the rear of the Hungarians, which could be always relied on to serve against that too independent people. The territory of the Military Frontier was, both in Hungary and Croatia, withdrawn from the control of the legislatures of those countries, and vested entirely in the minister of war at Vienna.

**MILITARY TENURES.** See **FEUDAL SYSTEM**.

**MILITIA** (Lat. *miles*, a soldier), the name usually given to a force enrolled for home-defence, but not kept under arms except in emergencies. In most of the European countries a force supplementary to the regular army is maintained for home-defence, but the system by which this is maintained differs widely, each nation having arrangements peculiar to itself. In England the origin of the militia can be traced back as far as the reign of Alfred, who, to protect the country against the invasions of the Danes, organized a defensive force, called the *fyrd*, which he based upon the tenure of the land, each district being required to furnish its quota of armed men in time of war, and to keep up their training in time of peace. After the Conquest, the force was still maintained in addition to the feudal army, and when the crown and the barons came into conflict the *fyrd* was encouraged by the sovereigns as a means of support against the encroachments of the nobility. From time to time alterations were made in the constitution of this force, but it was not abolished until 1604, when James I. substituted for it the "Trained" (more commonly known as "Train-") bands, to the number of 160,000 men. In the contest between the Parliament and Charles I. one of the chief points in dispute was the control of the train-bands and the appointment of the commissioners of array, by whom it was governed. During the Civil War most of the train-bands sided with the Parliament; but after the Restoration the supreme command was vested in the

king, and under him in the lord-lieutenant of each county. (Owing to the growing importance of the regular army the militia was neglected, until 1757, when, on account of the drain of men caused by the Seven Years' War, an Act for its reconstruction was passed, by which all able-bodied men from eighteen to forty-five, with certain exceptions, were liable to be selected by ballot for five years' service. The crown was intrusted with the power of calling out the militia in case of apprehended invasion or rebellion, Parliament being previously informed, if then sitting, or, if not sitting, being called together for this purpose. The militia was embodied in the periods 1757-68, 1778-83, 1792-1803, and 1815. It contributed largely to the army engaged in the Peninsula, and in one year alone (1799) 25,000 men volunteered from it for the regular army. From 1803 to 1815, 100,000 men, or two-fifths of those raised for the army, came from the militia. During the long peace which followed the fall of Napoleon the militia was suffered to fall into decay, but it was reorganized in 1858, and it rendered most important services during the Russian War and the subsequent Indian Mutiny, being embodied in 1854 and 1857. Since then it has been regularly assembled for annual training, and has been recognized as an important portion of the defensive forces of the kingdom. Some important changes were made in its constitution on the inauguration of the new army system of 1871, and the control of the militia was then transferred from the lord-lieutenants of counties to the war office. By the new regulations the militia virtually ceased to exist as a distinct body, and its regiments were attached to each brigade of infantry, under the command of the colonel of the military district, the whole force being thus practically amalgamated with the regular army. The votes for the maintenance of the militia now form part of the army estimates for each year, and the pay of the men while actually serving is nearly the same as that of the infantry of the line.

The ranks of the militia are always filled by voluntary enlistment, but the law whereby any deficiency can be made up by means of the ballot still remains in force, and is kept in reserve for cases of extreme emergency. The men of the general body of the militia are only liable to serve in any part of Great Britain, but there is a reserve of men, who may not exceed one-fourth of the whole number, who in return for an additional bounty undertake, when called upon, to join the regular army. This force amounts to more than 25,000 men, and in the mobilization of 1878 more than 20,000 became part of the regular army. To each militia regiment there is attached a permanent staff, consisting of an adjutant and a small number of non-commissioned officers, the latter being almost invariably men who have served in the regular army. The officers of the militia who have had two years' training are eligible for commissions in the regular army on passing an examination, while the officers of the militia and line are eligible for duty with either force, and may sit upon courts-martial indiscriminately. The uniform of the officers and men is now precisely the same as that of the regular corps of which they form part, except that in addition to the distinguishing regimental mark they bear the letter M upon their appointments. The training of the militia consists of a series of preliminary drills, usually lasting about two months, and an annual training, usually lasting about twenty-eight days. The statutory limits beyond which such training may not extend are six months for the preliminary training, and fifty-six days for the annual assembling. The militia includes garrison artillery, engineers, and infantry, and in the army estimates for 1887-88 the number of all ranks in the United Kingdom was set down at 141,488. These figures, however, represent the whole strength of the force, supposing the numbers in every regiment were complete. Such, however, is very far from being the case, for at the annual training

it is seldom that more than three-fourths of the number provided for in the estimates are present. The sum voted for militia expenses in 1887-88 was £571,500, of which £359,900 was for pay during the period of training, and the remainder for bounties and expenses of enrolment. The expenditure for the permanent staff, provisions, forage, clothing, and stores brought up the total charge to £1,410,650.

During recent years several of the British colonies have begun to provide for their own defence by the formation of a militia. In Canada a very effective force has been established, which includes cavalry, field and garrison artillery, engineers, mounted riflemen, and infantry, and the Australian colonies seem disposed to follow this excellent example. The formation of an effective militia throughout the colonies would be a valuable addition to the strength of the empire, and would give additional weight to the voice of Great Britain in international affairs. When, in 1878, war seemed imminent between Great Britain and Russia, some 10,000 of the Canadian militia volunteered for service, and in 1885 an Australian contingent fought by the side of the regular British troops in the Soudan.

**MILK** is an opaque fluid secreted by the mammary glands of the females of the animals belonging to the class Mammalia, and adapted to the nourishment of their young offspring. It is of a specific gravity (1030) somewhat greater than that of distilled water (1000), and possesses a peculiar faint odour and a slightly alkaline reaction. It consists, in addition to the watery portion, serum, &c., of globular particles, which are not more than half the size of the globules of human blood, having a diameter of about one ten-thousandth of an inch. They are composed of a fatty matter (butter) and a coagulable substance, which in many points resembles albumen, termed *casein*, or the matter of cheese. In fact, milk is an emulsion composed of numberless little fat globules coated with a thin layer of albuminous matter floating in a large quantity of water which holds in solution albumen, milk-sugar (lactose), and several salts.

The average composition of cow's milk is thus given by the most eminent analytical chemists:—Water, 85·8; sugar, 30; butter, 38; casein and other proteids, 68; chlorides, sulphates, phosphates, and carbonates of potash, soda, and lime (with sometimes a trace of iron), 6; total, 1000.

If we analyze the milk of various animals it will be seen that the goat's is, in one sense, the most nutritious:—

	Cow.	Ass	Goat.	Mare.	Human.
Water, . . .	85·8	90·5	82·0	89·6	89·0
Oil or butter, .	8·8	1·4	4·5	traces	2·6
Sugar and ex-	3·6	6·4	4·5	8·7	4·9
tractives, .					
Casein, albu-	6·8	1·7	9·0	1·7	3·5
men, &c., .					
	100·0	100·0	100·0	100·0	100·0

Goat's milk is, however, somewhat difficult of assimilation. It cannot, therefore, be recommended for the very delicate, but it is a valuable adjunct to the diet of those who are just beginning to regain strength after long severe illness. A residence at the sea-side to induce a healthy appetite, and give the power to assimilate a diet consisting largely of goat's milk, is often found the best way to restore convalescents speedily to health. A course of goat's milk may often be taken with advantage in the autumn by those who suffer much from cold during the winter months, but who do not care to take cod-liver oil.

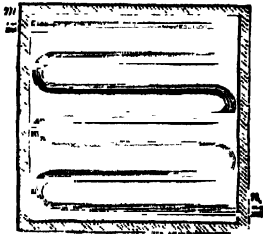
Again referring to the table, it will be seen that ass's milk contains a larger proportion of water, more lactine or milk sugar, and less oil and casein than cow's milk. This is the reason it is so easily assimilated, and is so often prescribed by the physician for patients who have delicate digestions.



Cow's milk most invalids can take. It is often an advantage to give it in conjunction with a little aerated water, because of its heaviness when unmixed, and its deficiency in water and sugar compared with human milk; and in cases where it has a tendency to turn sour or disagree with the stomach, it may occasionally be mixed with a little lime-water. When milk is allowed to stand, the fat globules rise to the top in the form of cream. Cream, if taken fresh in the morning, and if it can be well borne—which it usually can—is an excellent tonic and restorative. It should be taken with breakfast, and the fresher it is, and the better and purer the milk from which it has been taken, the better will be the result. The cream of goat's milk is probably better than even that of the cow. In giving cow's milk to young children who are weaned, the addition of water and sugar of milk is of course imperative, and few mothers are liberal enough with the water, to the great injury of the baby's digestive organs. Three pints of cow's milk contain as much solids as four of human milk; therefore at least a pint of water would be necessary to dilute this quantity.

Milk-farmers have succeeded in developing a breed of cows giving large quantities of milk of a poor (that is, a creamless) quality. For butter and cheese making quite different animals are kept, a favourite breed being the famous Alderneys.

If cream is beaten well, as by the paddles of a churn, or if a quantity be shaken in a bottle for some time, the envelopes of the fat globules break, and the fat runs together in the form of small lumps of butter. [See BUTTER.] If milk, be permitted to stand untouched for a time, varying with the heat and electrical condition of the weather, it turns sour and curdles. This change is due to the chemical change of lactin (milk-sugar) into lactic acid, causing precipitation of the casein (curdling) and its separation along with most of the fat globules, which get mixed up with the curd; the remainder, a thin sweet fluid, holding in solution most of the albumen, sugar, and soluble salts, is named *whey*.



Milk Cooler, with front plate removed; the cold water runs continually from *m* to *n*.

Milk is artificially curdled to produce the material for cheese, which is made from the compressed curd. The curd or casein also separates as a scum, rising to the surface when milk is boiled, and as fast as one scum is taken off another forms.

Milk, as it comes from the cow, is warm, and when at once put into large cans and despatched into the great towns from the farm, it is liable to chemical changes. The old plan was to chill the great cans by washing in cold spring water, and leaving a little water in the bottom of the can; but the modern plan is to cool the milk itself. The milk is placed in a pail with perforated bottom, whence it escapes in runlets over a corrugated surface of zinc, behind which a pipe conveying cold running water bends to and fro, as shown in the illustration. The milk spreads out in a thin sheet over the zinc, is cooled thoroughly, and falls into a trough which delivers it to the railway can beneath. Thus treated it rarely changes, even in the hottest weather.

Milk may be brought to a dry state and powdered, in which condition it keeps for a length of time; and by dissolving it in tepid water an artificial milk may be formed, capable of being used at sea, particularly for children, during long voyages. When mixed with honey or sugar, and evaporated at about 110 degrees to about a fourth of the original bulk, milk becomes a thick viscous

fluid, and if hermetically sealed in tins while yet steaming will keep sweet a very long time. This is the "condensed milk" of commerce, which when mixed with water serves as an excellent substitute for fresh milk when the latter is not procurable. As its composition is of course uniform, many doctors recommend it on this score as the basis, when properly diluted, of infants' food; but the great majority yet prefer the fresh form as a food. Milk is an antidote in cases of poisoning by some metallic salts, such as corrosive sublimate, perchloride of tin, sulphate of copper, &c.

**MILK SUGAR.** See LACTIN.

**MILKY WAY**, a remarkable, luminous band stretching completely round the heavens, and following a great circle with more or less regularity. This wondrous object is formed entirely of incredible myriads of minute stars so faint that they cannot be distinguished separately without the aid of a telescope. The great circle which, on the whole, coincides with the Milky Way, has its pole in 12 hrs. 38 min. of right ascension, and 81° 5' of north declination. Starting from this pole, the number of stars are found to increase steadily down towards the Milky Way. Suppose, for convenience, that an observer be so placed that this pole is in his zenith, and the Milky Way consequently in his horizon, then at different zenith distances we have the following average number of stars visible in a telescopic field of 15 minutes in diameter, i.e. in a region equal to one quarter of the area of the full moon.

Distance from Pole of Milky Way.	Average number of stars in a field 15' in diameter.
0° .	4.15
15 .	4.68
30 .	6.52
45 .	10.36
60 .	17.68
	30.80
90	122.00

From this we see that the mean density of the stars in the Milky Way exceeds in a ratio of nearly thirty to one the number of stars at its pole. These figures have been deduced from observations of Sir W. Herschel, who counted the stars in different fields selected so as to give a fair sample of the heavens generally.

Much speculation has arisen as to the actual nature of that stupendous system of stars which forms the Milky Way. Without any telescopic investigations, the actual appearance suggests the view that the Milky Way is really a flat layer of stars of more or less regularity, and that the solar system is inside the layer. This view coincides to a considerable extent with the actual appearance of the galaxy, but even if it be substantially true, there are still certain modifications necessary. For instance, at one part the Milky Way divides into two streams. This has involved the supposition that the layer must be cleft to the centre, but even then we would require to make other suppositions to account for Regia's intense stars, which are present in the famous "Coal-sacks," in the southern hemisphere. The difficulty in the problem arises from our ignorance of the distances of the stars. We can only speculate on the actual shape of the Milky Way when we have certain hypotheses as to the distances of the stars. We may, for instance, assume that the stars are equally large, and then their apparent brilliancy will afford some measure of their relative distances; but any such assumptions are really of little use, as they are often conspicuously untrue whenever we have the opportunity of testing them. The brightest stars are not always the nearest, and any assumption bearing on the equality of stars is really quite unreliable.

**MILL, BARKER'S.** See BARKER'S MILL.

**MILL, JAMES**, was the son of a working shoemaker, and was born at the North-Water Bridge, about 7 miles



from Montrose, 6th April, 1778. He was sent to the University of Edinburgh, where he was educated for the church. He was licensed to preach about 1798; but he changed his views, and in 1802 accompanied Sir John Stuart to London, where he settled. He became editor of the *Literary Journal*, and for several years was an occasional contributor to the *Edinburgh Review*. He became a great friend of Bentham, and was almost as influential in elaborating the utilitarian philosophy, and the other "Benthamite heresies," as his better known associate. By 1810 the two had become inseparable, and Mill and his wife lived altogether with Bentham for many months at a stretch. A coolness, however, replaced this ardent friendship after 1818.

Mill's "History of British India" was commenced about 1806, but, being a work of great research, it was not published till the winter of 1817-18. In consequence of the ability and knowledge of the subject which it displayed, and although he had in some parts of it freely censured the conduct of the East India Company, the Court of Directors, in 1819, intrusted to him the chief conduct of their correspondence with India in the revenue branch of administration. He afterwards rose to be head of the department in the India House of correspondence with India.

Mill had in the meantime become a contributor to the "Supplement to the Encyclopedia Britannica," his principal contributions to which were the articles on Government, Education, Jurisprudence, Law of Nations, Liberty of the Press, Colonies, and Prison Discipline. He was an insatiable worker, often writing and reading from four in the morning to midnight. His "Elements of Political Economy" was published in 1821-22. In 1829 he published his really valuable "Analysis of the Phenomena of the Human Mind," a work on which he bestowed more of the labour of thought than on any other of his productions. His last work was the "Fragment on Mackintosh," published anonymously in 1836. He died at Kensington, 23rd June, 1836. ("Biography of James Mill," by Professor Bain, London, 1882.)

**MILL, JOHN STUART**, son of the preceding, and an eminent political economist and philosopher, was born in London on 20th May, 1806. He was educated by his father, and at an unusually early age became thoroughly acquainted with classics, philosophy, and political economy. The list of works he had read when a boy, given in his autobiography, is simply astounding. It is, however, fully corroborated. In 1823 he entered the East India Company's office as a clerk in his father's department, and rose through the various grades till he became second assistant examiner, on the promotion of his father to be chief examiner, of political correspondence, in 1831. He then for many years continued to render effective service to the company, mostly in its political transactions, though also occasionally in the departments of public works and education. Finally, in 1856, two years before the extinction of the company as a governing body, he himself succeeded to his father's old place, and assumed the chief management of its foreign relations. When the transfer of the government of India was made to the crown he retired from official duty on a well-earned pension, declining, on the score of failing health, an invitation, made in the most flattering manner by Lord Stanley, to take a seat on the newly-constituted Board of the Indian Council.

Steady official work, however, had filled up but one half of Mill's life during these thirty-five years. He was only twenty-one when he came before the public as the editor of one of Bentham's greatest treatises, "The Rationale of Judicial Evidence;" and even before that time he was a frequent contributor to the *Westminster Review*, which had been started under Bentham's auspices as the organ of the philosophical Radicals, and also to the

*Morning Chronicle* newspaper. From 1835 he became editor, and with Sir William Molesworth (then an ardent young Radical member of Parliament, much under the influence of the Grotes) joint proprietor of the *London Review*, which was incorporated with the *Westminster Review* in the following year; and in this capacity he continued till 1840. The annals of English periodical literature may be searched in vain for a parallel to that brilliant editorship of five years. He attracted round him a staff of literary and political critics—Carlyle, Harriet Martineau, Blanco White, Molesworth, Roebuck, and others, whose contributions, initiated after a uniform fashion, may still be reverted to with unfading interest. But it was on himself that the chief labour devolved of imparting tone and breadth to the *Review*; and few things are more remarkable than the series of essays, most varied in cast and finished in style, including the celebrated articles on Bentham and Coleridge, that he contrived somehow in his odd hours to pen.

His first great work appeared in 1843. The gaps in logical doctrine which years before he had sharply detected he had been able in the course of protracted meditation to fill up; and now, in a widely-drawn "System of Logic, Ratiocinative and Inductive," he not only gave general theoretic expression to the methods of modern science, but, without deserting the traditional point of view of English thought, succeeded in welding them into one comprehensive theory of evidence, along with the old syllogistic doctrine so greatly disclaimed by the ignorant, and so unworthily neglected by the specialists of modern times. Compared with anything done in the direction of logical theory by previous English philosophers, the advance in speculative insight must be held to be enormous. The book, in fact, leaves nothing, or very little, to be said on the subject to which it relates, and it has the great and memorable merit of having set upon a basis of its own the logic of things as distinguished from the logic of words, with a degree of solidity and precision which in all probability will never be surpassed.

From logic and philosophy, when he had thus, in the full maturity of his mental powers, begun to give systematic expression to his thoughts, Mill passed to political economy, and the publication, in 1848, of his "Principles of Political Economy, with some of their Applications to Social Philosophy," stamped him henceforth as a master in it. In this work, now also become classical, he aimed at nothing less than to be to the nineteenth century what Adam Smith had been to the eighteenth; nor did he fall short of his high endeavour. This book being written by a philosopher, rivalled the philosophic work of Adam Smith in grasp of principles; while it has itself had no rival and hardly a second among more modern works in comprehensiveness of view, and in insight into the limits of the science with reference to the more commanding doctrine of general "sociology." The book is a most remarkable illustration of the truth that a political economist need not be the slave of his own theories, and that it is one thing to say, "This is the way to get rich," and quite another to say, "The one duty of all men, everywhere and at all times, is to get rich." It should always be remembered to Mill's lasting honour, that he clearly perceived the difference between studying the working of the desire for riches, assuming it to have perfectly free play, and erecting it into the one power by which human affairs ought to be governed.

After 1848 a long pause in Mill's literary activity seemed to supervene, broken only as controversies were forced upon him by the critics of his two great works, or by occasional articles, chiefly in the *Edinburgh Review*. In 1859, however, after he had, as we have before stated, been set free from the cares of office, he published a pamphlet giving "Some Thoughts on Parliamentary Re-

form," in which he argued against the ballot, and in favour of an educational test for the franchise and a representation of minorities, and also a small work, though the fruit of many years of thought—the famous "Essay on Liberty." His "Considerations on Representative Government" appeared in 1861, and his essays on "Utilitarianism" and on "Comte and Positivism" followed. In 1865 he issued his elaborate "Examination of Sir William Hamilton's Philosophy," on which he had long been engaged, and which he chose as the medium through which to argue the chief philosophical questions pressing on the mind of his generation.

In 1865 Mill was returned as member of Parliament for Westminster, having only consented to stand on condition of being relieved from the task of attending to purely local business. Although he entered freely into the debates on questions in which he had taken special interest, and on occasions rose to a height of impressive argument and earnest rhetoric quite unexpected, it soon became generally felt that his peculiar talents were to some extent wasted in the House of Commons; besides which, on more than one occasion, he gave great offence to the more moderate among his own supporters in consequence of his rigid adherence to his principles leading him to enunciate very extreme views. Accordingly, he was defeated at the general election in 1868. He took leave of the electors with the dignity of a philosopher, and the day after was back to his old pursuits, which had been interrupted during his three years of parliamentary labour and excitement. As an act of filial piety he prepared a new edition of his father's "Analysis of the Human Mind," and soon after this was followed by an essay on the "Subjection of Women." The publication of this essay, his motion and speech in Parliament in 1867, for the first time launching the question of the female franchise into the current of practical politics for statesmen henceforth to reckon with, and the arguments constantly renewed in his standard political works, were the expressions of long and deliberately entertained opinions. But it can hardly be doubted that the intensity of his conviction was in part due to the friendship he formed early in life with a gifted lady, Mrs. John Taylor, whom he married, after she had become a widow, in 1850. An invalid from about the time of her second marriage, Mrs. Mill died in the winter of 1858-59 at Avignon, in the south of France.

After quitting Parliament Mill spent the greater part of his life at Avignon, and died there somewhat suddenly, from an attack of erysipelas, on 8th May, 1873. After his death some curious essays of a religiously philosophical cast and a most remarkable autobiography caused much discussion. The autobiography is now regarded as a classic in its way; but as showing the unhappy rigour of the elder Mill, who took all brightness and healthy colour from the life of the poor boy who called him father, it is exceedingly depressing reading. A more fatal mistake was never made; and one cannot help feeling that we were robbed by it of much of the proper results of one of the most sensitive and thoughtful minds of the century. Great as John Mill is, in kinder circumstances he would have been far greater. A valuable companion to the autobiography is the "Criticism of J. S. Mill" by Professor Bain, London, 1882.

**MILL, MILLING.** The art of grinding cereals into flour, in its simplest form, is probably one of the most ancient known to man. The early form of handmill is common to most races, and consisted of two stones—the lower fixed, the upper movable, and generally provided with a handle. It was generally fed with grain through a hole in the centre, the flour or meal being delivered at the circumference into a sheet placed to receive it. From this primitive contrivance it was but a step, though a most important one, to drive the stone by animal and then by mechanical

power. That of running streams was probably the most easily accessible. The various forms of water-wheel will be found described under **HYDRAULICS**. In the middle ages windmills were introduced into Europe from the East, and speedily became universal in flat districts, although this mode of propulsion was even more uncertain than water-power. Finally, steam-power was applied to flour-mills in situations where other motive power could not be economically used.

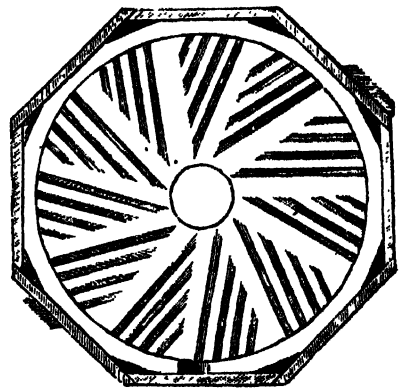
The first operation in a flour-mill is the cleaning of the grain. The machinery used for this purpose is of three kinds. The first consists of a series of sieves, which remove the foreign materials, stones, shells, &c., and finer impurities from the grain. The second apparatus removes the husk of the grain, the top stone being elevated so that none of the grain is reduced to powder during the action. The third separates sand, dust, or any other dirt from the grain by attrition; to effect this a cylinder lined with brushes is made to revolve, and these, by scrubbing the grain against the cylindrical file-like surfaces of the case, effectually detach all the lighter bodies. The light dirt being disintegrated, is afterwards removed completely by a winnowing fan worked by the machinery.

The next process is the actual reduction of the grain to flour or *grinding*, and its separation into the different qualities of flour. Mills which use millstones contain three classes of machinery—that for the actual grinding, the hopper which supplies the grain to the stones, and the bolter and its case, where various sieves produce flour of the requisite fineness.

In noticing the first class of machinery the millstones claim priority. These are rarely entire, being almost always constructed of several blocks cemented together by gypsum or Portland cement, and surrounded with strong iron bands. Their size varies from 3 to 5, and occasionally 7 feet in diameter. The stone should be so hard that it will not readily become smooth, yet not so hard as to render its dressing or grooving difficult. Blocks hewn out of the Rhenish lavas are preferred in Germany for their hardness and open texture. The best millstones in this country are made from a very hard silicious rock, known by the name of Buhr or Burrstone, and found only, in any quantity, in the vicinity of Paris and a few other places in France.

In cutting these stones the surfaces of contact are not left smooth, but are indented to a depth of from a quarter

Fig. 1.

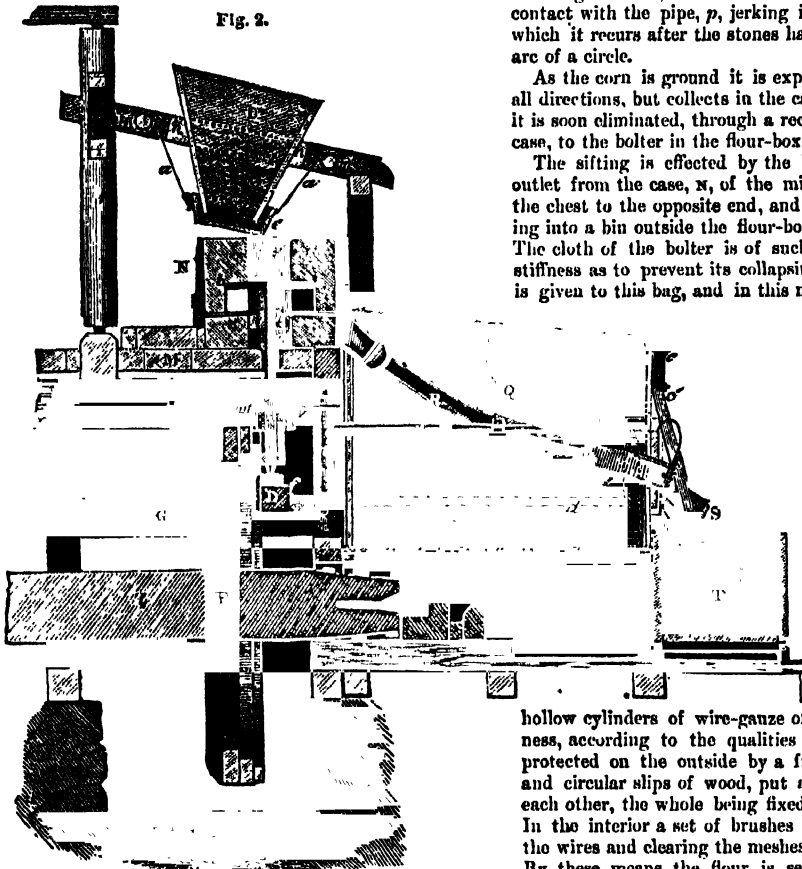


to one-eighth of an inch, in a series of lines diverging from the centre to the circumference. This grooving is called the "dressing." The grooves in the top stone, or "runner," are so adapted to the lower or "bedstone" that, when motion is communicated to the former, an action takes

place between the indentations of both stones similar to that of shears or scissors. Both stones are grooved in the same manner and direction, but when the runner is afterwards placed in its working position, the course of the stones, as also that of the channels, is reversed, and both the edges meeting in opposition, cut the intermediate grain into fragments; these, in being swept over the "landings," or smooth spaces of the millstones, are ground fine. Fig. 1 shows a common arrangement of the furrows.

Fig. 2 is a section of the simplest type of mill. The shaft from the motive power is represented in the illustration by *z*; upon this the second or principal wheel, *r*, is constructed, the cogs of which act upon the fly, *x*, of the

Fig. 2.



spindle, *c*, which is an iron bar forming the axis of the stones; its lower end is conical, and rests upon a bed of steel, *f*, which is supported by the beam, *d*, fixed upon other crossbeams, *g* and *i*, forming a kind of leverage, whereby the beam, *d*, and spindle, *c*, are depressed or elevated as required. The stones which grind the corn are *a* and *b*, the latter being the bedstone, in the middle of which, as at *g*, the iron bar, *c*, passes through a tightly-fitted packing-box, *h*, to the runner, in which it is fastened by fixing in the circular space cut away—about 6 or 8 inches in diameter—an iron bar, *b b*, having a rectangular hole in the centre, into which the end of the axis, *c*, exactly fits. This apparatus is called the "ryne."

A case, *n*, envelope both stones to protect them from dirt and to prevent the flour from being scattered about by the centrifugal force of the runner. Over that part of the machinery already described a prismoidal-shaped hop-

per, *o*, is supported upon a frame, *n n*; into this box the grain is emptied, whence it is supplied to the stones by the motive power of the mill. The bottom of the hopper is received into a movable box, *e*, called a *shoe*, which is suspended by the cords, *a a*, passing round the fluted rollers, *m m*, in such a manner that the orifice in the bottom is partially closed, allowing no more grain to pass from it than is necessary to supply the stones. The corn is not let in at one place, but is made to enter on each side of the ryne by a shaking motion communicated to the shoe by the iron pipe, *p*, which at the same time conducts the grain to the runner. The rod or pipe descends a few inches into the circular space in the top stone, *a'*, where a serrated iron ring is fixed; as the stones turn the notches come in contact with the pipe, *p*, jerking it out of its position, to which it recurs after the stones have revolved through the arc of a circle.

As the corn is ground it is expelled from the stones in all directions, but collects in the case, *n*, whence, however, it is soon eliminated, through a rectangular opening in the case, to the bolter in the flour-box, *q*.

The sifting is effected by the bag, *r*, attached to the outlet from the case, *n*, of the millstone, passing through the chest to the opposite end, and secured to a pipe opening into a bin outside the flour-box for receiving the bran. The cloth of the bolter is of such a fibrous texture and stiffness as to prevent its collapsing. A continual motion is given to this bag, and in this manner the finer parts of

the flour are sifted through the bolter-cloth; while the coarser flour and bran pass off to the bin, *t*, or are received in the sieve, *s*, where the coarser parts of the flour are completely removed.

An ingenious machine for dividing the flour from the bran, and which is very generally used, separates several kinds, according to their state of division, at one operation. It is termed the "dressing machine," and consists of long

hollow cylinders of wire-gauze of various degrees of fineness, according to the qualities of flour to be produced, protected on the outside by a framework of longitudinal and circular slips of wood, put at regular distances from each other, the whole being fixed in an inclined position. In the interior a set of brushes revolves, rubbing against the wires and clearing the meshes from adhering particles. By these means the flour is separated into three great classes of material—(1) the true or fine flour; (2) the "middlings," which is made up of broken and partly-crushed grain which has escaped the grinding; and (3) the "offal," chiefly consisting of bran, with which a certain proportion of flour is mixed. The true flour is separated by the dressing machine into different grades, according to the requirements of the market, such as finest and what is called seconds, the bran and middlings passing off at the end of the dressing machine.

In large mills millstones have been very generally superseded of late years by metal rollers. These enable a higher quality of flour to be manufactured with less expenditure of power in proportion to the production. The process of reduction to flour is in this case a gradual one; the first rollers merely crushing the grain sufficiently to allow the bran to be separated, which prevents any part of it being ground and mixed with the flour, to the injury of its

colour. By passing the grain through a graduated series of rollers, some plain and others fluted on the surface, after the manner of millstones—the produce being sifted by the dressing machine between each rolling—a very high quality and percentage of fine flour is at last obtained.

As many other substances besides grain require to be ground, mills of various types have been designed to meet the requirements of different materials. One of these consists of a pair of circular stones called “edge-runners,” arranged like a pair of wheels on an axle, and made to travel in a circle *over* the substance to be ground, which lies in a bed below them. Other mills have been constructed to imitate the action of a pestle and mortar, the pestle rotating on its own axis, besides moving round its bed.

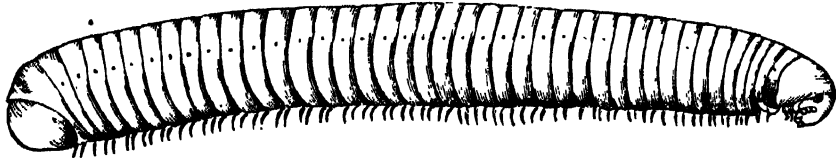
**MILLENNARY PETITION**, the petition presented to James I. in 1603, by 1000 (*nulle*) of the Puritan clergy (whence its name), praying for reformation in ecclesiastical matters. This led to the Hampton Court Conference between the church party and the Puritans, at which the Prayer Book was revised and the Authorized Version of the Scriptures was agreed upon (appeared 1611).

**MILLENNIUM** (Lat., “the space of a thousand years”) is the name commonly used in the church to denote a period in the future during which it has been believed the Messiah will reign upon the earth. It arose first among the Jews in the period subsequent to the return from Babylon, when in their troubles and perplexities they sought for light from the writings of the prophets. In these as they have been preserved to us we find numerous promises in reference to the restoration of the Jews, and the setting up of a Messianic kingdom, which certainly had no adequate fulfilment in the actual return and the subsequent history of the nation. The predominant ideas in these early prophecies seem to have been the setting up of a renewed and purified kingdom of Israel in the Holy Land, the centre being at Jerusalem, the members of which should be exalted to the first place in the earth, other nations, having been brought into due subjection, being blessed through them. In most of the prophecies these events are spoken of as being in the immediate future, the kingdom being referred to as one destined to last for ever, but in course of time a system of eschatology was developed in which the earthly kingdom of the Messiah was regarded as being only a preliminary to the final consummation of all things. Various periods for its duration were assigned by the Rabbis, their estimates varying from forty to 7000 years. In the apocryphal 2 Esdras vii. 28, the period is given as 400 years, and this, as corresponding to the duration of the Egyptian captivity, is also mentioned in the Talmud; but the opinion most widely received was that which, by a literal interpretation of Psalm xc. 4, made the “day of the Lord” one thousand years. The latter idea had become very common among the Jews in the period immediately preceding the birth of Jesus, and when the church became established on the foundation that Jesus was the Messiah, the expectation of his second advent in power and majesty became a potent influence in the spread of Christianity. It is evident from many passages in the Gospels and the Epistles that this event was regarded as being near at hand, as for instance Matt. xxiv. 84; Mark xiii. 80; Luke xxi. 82; 1 Thess. iv. 13–18; Heb. x. 25; 1 Peter iv. 7, &c. As the years rolled on, however, and these expectations were not fulfilled, a spirit of doubt seems to have crept in, such as we find combated by the writer of 2 Peter in chap. iii. 7–9, but the hope seems on the whole to have been sustained throughout the whole of the apostolic period. It is only, however, in the book of Revelation that we find a definite period assigned for the duration of the Messianic kingdom—viz. 1000 years (Rev. xx. 1–6); and here the period is placed almost immediately before the final judgment. In the first century and the first half of the second, millenarianism (more

frequently termed *chiliasm* by the fathers, from the Greek *chilioi*, one thousand years) was universally accepted among Christians, and the apocalyptic writings of the Jews were earnestly studied, the promises they contained for the people of Israel being readily transferred to the spiritual Israel of the church. These writings in their turn gave rise to the production of apocalyptic works of a purely Christian character, some of which enjoyed almost a canonical reputation for several centuries. In the earliest of these the pictures of the millennium are of a very material nature, and the kingdom of the returned Christ bears some resemblance to the paradise of the Mohammedans in the prominence given to eating, drinking, and the enjoyment of other pleasures of sense. The notion that the time was near seems to have been given up, and in the Epistle of Barnabas it is fixed at the end of 6000 years of the world's history. Soon after the middle of the second century, however, we find a party in the church who called in question the whole theory of the millennial reign of Christ. The doctrine was earnestly defended by the Montanists, but their defence served rather to discredit it with the orthodox, and the increasing influence of the Alexandrian philosophy helped to push it further into the background of Christian theology. A more spiritual doctrine was advocated by Origen, who looked forward to a gradual diffusion of Christianity throughout the world, and the prevailing system of millenarianism was still more effectually assailed by his pupil Dionysius, bishop of Alexandria. Under the influence of the latter the doctrine fell into disrepute as a Jewish theory, and the Apocalypse of John was removed from its place in the canon and put among the doubtful books. The latter was restored to the canon of the Greek Church after a lapse of several centuries, but the millennial doctrine never attained much authority in it. In the Western Church a new current of speculation was introduced by Augustine, who represented that in the church the kingdom of Christ had been set up on the earth, and the expectation of a coming city of God gave way before the attempt to find this already established in the Christian church. The doctrine of the millennium never obtained authoritative sanction after this, but as a pious opinion or as the badge of a party, it has never ceased to keep a place in the domain of Christian thought. It has received the support of many eminent thinkers in the church, especially among those who felt most deeply the contrast between the ideal kingdom of Christ, and the corruption, worldliness, and selfishness so plainly visible in the church as it was. At the time of the Reformation millenarianism obtained a partial revival, and it led to some strange manifestations in the Anabaptists of Munster and the Fifth Monarchy men of Puritan England, but it never obtained official sanction in the Protestant churches, though as a pious opinion based upon the verbal inspiration of the Bible it has been held by many Protestant theologians. The doctrine has in modern times lost all *practical* significance, and it is entertained purely as a speculation by those who accept it. The conception of the nature of the written words of Scripture which led the Jews into all the fantastic interpretations of the Kabbala, finds a mild counterpart in the attempts at interpreting the prophecies among Christians. To minds of a certain order the study of the apocalyptic passages of the Bible offers an irresistible charm, and every few years some little temporary and local excitement is caused in the religious world by a fresh discovery of the date of the millennium or of the day of judgment. The celebrated Bengel fixed the date for 1836; Swedenborg taught that the millennium had begun in 1757; William Miller in the United States attracted widespread attention by his predictions, based upon the study of the prophecies, that the second advent was due in 1843; and more recently Dr. John Cumming of London tried to persuade himself and his

followers that the end of the present dispensation was due in 1867. (See Corradi's "Kritische Geschichte des Chiliasmus," Zurich, 1794; Gieseler's "Lehrbuch der Kirchengeschichte," English translation, 1855; and Hodge's "Systematic Theology," Edinburgh, 1878.)

**MILLEPEDE** is the common name of the myriapods, belonging to the family Julidæ, which is the type of the order Chilognatha. The millepedes have horny and usually cylindrical bodies, formed of numerous unequal segments, each of which, after the fourth or fifth, bears two pairs of short, weak legs; a vertical rounded head, furnished with two mandibles, which are either thick and robust, or united with the labium and elongated, and have no palpi. The antennæ are two in number, short, either slightly thickened towards their extremities, or thread-like throughout, and composed usually of seven points. Simple eyes are generally present, arranged in patches near the base of the antennæ.



*Spirostreptus obtusus.*

Several species are British. In the Siphonantia, the lowest family of millepedes, the body is semicylindrical, the head small and concealed beneath the margin of the following segment; the parts of the mouth are united into a sucking-tube, and the legs are short and concealed beneath the broad body. The species are few in number, and the majority are exotic; they are found in rotten stumps of trees.

The remarkable genus **PAUROPUS** seems a connecting link between the centipedes (Chilopoda) and the millepedes, and may be considered as forming a distinct order of Myriapoda.

**MILLEPORE** (Milleporidæ) is a family of **HYDROZOA** belonging to the order Hydrocorallinæ. The millepore polyps form large colonies, which have various arborescent shapes, and present the appearance of white coral. The dead millepore colony is a hard, white, calcareous mass, marked with numerous pores arranged more or less in distinct groups. These pores lead into long tubular cavities, across which at regular intervals are formed transverse platforms or tabulæ. The calcareous skeleton is formed by the deposition of calcareous matter in the ectoderm of the lower portion of the body of each polyp. In the living state the anterior portion of the body of the polyps can be protruded from the pores. The polyps are of two distinct kinds, gastrozooids and dactylozooids, that is, mouth and finger zooids. The gastrozooid is a short thick polyp provided with a mouth and a few short tentacles. The dactylozooids are long slender cylindrical polyps with tentacles disposed at intervals along the whole length of the body, but without a mouth. These finger-like polyps are often arranged in a circle round the gastrozooid, take no food themselves, but catch food and convey it to the mouth-like polyp in the centre. The tabulæ are formed as the polyps leave each chamber and form a higher one. The method of reproduction is unknown in the millepores, nor has any medusa form been discovered. The species are found on coral reefs.

**MILLER, HUGH**, a distinguished author and geologist, was born in Cromarty, on the north-east coast of Scotland, 10th October, 1802. His father, a sailor and owner of a trading sloop, perished at sea when Hugh was only five years old, and he was brought up by his mother, who was assisted in her charge by Hugh's two uncles, James and Alexander Wright. They were both pious and

These animals move slowly and with a gliding motion. When disturbed, they roll themselves up spirally, or into a ball. They feed on decomposing animal and vegetable matter.

The millepedes are found in all parts of the world, but attain their largest size in the tropics. They are nocturnal, and are found under stones, sticks, the bark of trees, &c. The common British species, *Julus terrestris*, is a little over an inch in length, with a hard, cylindrical, blackish body. *Spirostreptus* (see woodcut) also belongs to the family Julidæ.

The Pill Millepedes (Glomeridæ) resemble Julidæ closely, but have a short body consisting only of twelve or thirteen segments, and have the power of rolling themselves up into a ball. The Polydesmidæ, another family of the Chilognatha, have the body much flattened, and more resembling that of a centipede, no eyes, and very small antennæ.

industrious men, possessed of no little originality of character, and from Uncle Sandy the boy derived a taste for natural history, while Uncle James instructed him in traditional lore. Hugh was educated at the grammar-school of Cromarty, and his uncles were desirous that he should study for the church; but as he felt no call to the ministry he adopted the trade of a mason, resolved to devote all his leisure to self-improvement. He laboured at this vocation from his seventeenth to his thirty-fourth year, employing his leisure in reading and in the observation of nature; and in 1829 he made his first appearance as an author by publishing "Poems Written in the Leisure Hours of a Journeyman Mason." A series of letters on the herring fishery, published in a Scottish newspaper, helped to extend his reputation, and he then gave up the work of a mason and obtained a position as a bank clerk at Cromarty. Shortly afterwards he published his first important work, entitled "Scenes and Legends of Cromarty," and two years after obtaining his clerkship he married a beautiful and accomplished lady, Miss Lydia Fraser. The non-intrusion controversy in the Scottish Church drew from him a pamphlet, "Letter to Lord Brougham," which attracted so much attention that it led to his being appointed editor of the *Witness*, the organ of the Free Church party, a position which he retained until his death. A series of articles on "The Old Red Sandstone," which appeared in that journal in 1840, gained for him the unequalled admiration of the leading British geologists, and Agassiz named one of the newly-discovered organisms of this formation, *Pterichthys Milleri*, in his honour. An accurate observer and an original thinker, Miller possessed a power of picturesque description peculiarly his own—a power which Dr. Buckland declared "he would give his left hand to possess;" and it is this which, as much as anything, has given his works their widespread and enduring popularity. In 1847 he published his "First Impressions of England and its People;" in 1849, "Footprints of the Creator;" and the "Testimony of the Rocks" appeared in 1857. While the latter work was on the eve of issuing from the press the author became affected by cerebral disease, brought on by incessant toil, and on the night of 23rd December, 1856, he shot himself in his study. He was a man of a high and noble character, and he has left an enduring mark alike in the history of geology and of British literature. For an account of his early life see

his work entitled "My Schools and Schoolmasters," one of the best autobiographical works in the language. His "Life and Letters," by Peter Bayne, appeared in two vols. (London, 1871).

**MILLERITE** is the sulphide of nickel (NIS) or nickel pyrites. It usually contains traces of copper, cobalt, iron, &c., and occurs in fine capillary crystals (hence it is sometimes called *capillary pyrites*) or wool-like masses. It is found not uncommonly associated with ores of cobalt, nickel, and copper, but seldom in sufficient quantity to be of much commercial importance. Millerite is of a brassy-yellow or bronze-yellow colour, and has a metallic lustre; its specific gravity is about 5, and its hardness over 3.

**MILLER'S THUMB.** See BULL-HEAD.

**MILLET** is a name given to various kinds of grain, but most usually to *Panicum miliaceum* (common millet). This grass grows to a height of 3 or 4 feet; its "head" is much branched, bristly, and hangs down. In this country millet is used chiefly for poultry and caged-birds, but in other countries it is mixed in the form of groats with wheat flour and made into bread. It is cultivated to a great extent in India and the Mediterranean region, and will ripen its grain as far north as the cultivation of the vine extends. Heer, in his work on the plant-remains found in the Swiss lake-dwellings ("Pflanzen der Pfahlbauten") recognizes millet as having been used extensively in the Stone Age, and it is supposed to be the grain called "miliun" by the Romans, and "keghros" by the Greeks. It is doubtful whether its native country can ever be determined, but De Candolle thinks that the probability lies with Egypt and Arabia. It is now found naturalized in the warmer parts of Europe and Asia.

Italian Millet (*Panicum italicum*) grows 4 or 5 feet high, and a light dry soil suits it best. It is frequently cultivated in Southern Asia, but scarcely at all in Europe; therefore "Italian" millet is a misleading name. The plant was, however, in use in prehistoric times, as is proved by the large quantities of it found in the lake-dwellings, and it is mentioned in Chinese writings 2700 B.C. as one of the five plants which the emperor sowed every year in a public ceremony. There is an ancient Sanskrit name for it, which is preserved in the modern Bengali. De Candolle infers from history and philology and from botanical considerations that the species existed before being cultivated, thousands of years ago, in China, Japan, and the Indian Archipelago. Judging from the existence of the Sanskrit name, the cultivation was extended westwards in very ancient times. It does not appear to have been propagated in Arabia, Syria, or Greece, and probably reached Switzerland by Russia and Austria. Indian millet is a species of *SONGHUM*.

**MILLET, JEAN FRANÇOIS** (1815-75), the famous French artist whose canvases now fetch fabulous prices, was the son of Cherbourg peasants, so poor as to be unable to afford him any art training. For this he was indebted to the parish authorities, who had observed the great genius of the lad, and sent him to Delaroche. He found that master's historical style uncongenial, and as soon as he had acquired the technical mastery of his art he left Paris for the forest of Fontainebleau, where he painted from nature—trees, rocks, and peasants—in the marvellous way with which either the originals or the frequent engravings have familiarized us. Millet subtly brings out the true pathos and poetry underlying the actual life and scenery of to-day without idealizing—that is, departing from accurate truth.

**MILLIAM PERE**, the thousandth part of an AMPERE. one of the electrical units.

**MIL'IMETRE**, the thousandth part of a metre, = 0.0003937 of an inch (nearly four hundredths of an inch).

**MILLSTONE GRIT** is the name applied to the medial subdivision of the Carboniferous formation: it underlies the coal measures, and consists of grits, flagstones, and

shales, and in some places thin seams of coal. It contains few fossils, but has a wide distribution in Great Britain, though varying much in thickness. It is well represented in the South Wales and adjoining coalfields. In North Staffordshire and the Pennine district it attains its maximum development, but north of this it thins out. In parts of Scotland it is represented by the Moor rock, though in some other districts it does not appear to exist as a separate formation.

**MILMAN, HENRY HART**, Dean of St. Paul's, an eminent author and divine, was the third son of Sir Francis Milman, Bart., and was born 10th February, 1791. He was educated at Eton, and then proceeded to Brasenose College, Oxford. In 1813 he obtained his degree of B.A., taking a first class in classics, and about this time he produced the tragedy of "Fazio," which was acted at Covent Garden. Milman was ordained in 1816, and the following year was appointed vicar of St. Mary's, Reading. Continuing his literary labours he successively brought out "Samor," a heroic poem; "The Fall of Jerusalem," "The Martyr of Antioch," "Belshazzar," and "Anne Boleyn," all dramatic poems. He became in 1827 Bampton lecturer; and he was, from 1821, for ten years professor of poetry at Oxford. He published a metrical version in English of a Sanskrit poem, entitled "Naba and Damayanta." Then came his most important works—"The History of the Jews," "The History of Christianity, from the Birth of Christ to the Abolition of Paganism in the Roman Empire," and the "History of Latin Christianity to the Pontificate of Nicholas V." The latter work represents the most laborious and eminent of his literary labours, and it has given him a distinguished place among modern historians. He was appointed in 1835 rector of St. Margaret's and canon of Westminster, and was promoted in 1849 to the deanery of St. Paul's. He wrote a "Life of Kents" and a "Life of Horace," which is prefixed to the beautiful illustrated edition of that poet published in 1849. He also prepared an edition, with copious notes, of Gibbon's "Decline and Fall of the Roman Empire." His latest work was the "Annals of St. Paul's," which was in the press at the time of his death, 25th September, 1868. Dean Milman was much and justly beloved both in public and private life. His society had a charm about it that fascinated all within its influence. His knowledge on most subjects was wonderful, and its effect was enhanced by the earnestness and amiability of his disposition.

**MILO**, of Krutóna, the leading Greek city in *Magna Græcia* (Southern Italy), was the most famous athlete of ancient Greece. He was victor at six Olympic and six Pythian games—that is, he was unequalled for a quarter of a century. Attempting a seventh Olympic contest as an elderly man, he was not able to command his former agility, though his strength was but little impaired, and he failed to get the prize. He was held in great honour by his countrymen, and even led the army against Sybaris, B.C. 511. To test his strength he once carried a heifer on his shoulders along the Olympic racecourse, and then ate the whole of it in one day. His death came from a similar wager. He had torn a tree asunder by main force, but his strength, though equal to a sudden effort, could not sustain it; the tree slowly regained its shape, and Milo, imprisoned by the hands, fell a prey to wolves.

**MI'LO**, anciently *Meloa*, one of the larger Cyclades, in the Ægean Sea, about 70 miles N. of Crete, and 65 E. of the Peloponnesos. It is 14 miles long from east to west, and its breadth is about 8 miles. Its northern coast is indented by a deep bay, which forms a natural harbour, one of the best and safest in the Levant. The island is mountainous, and of volcanic formation; it has hot mineral springs and mines of sulphur and alum. The soil produces abundance of fruit, wine, oil, and pasture for cattle. The population is 4000.

There are extensive remains of the ancient capital of the island, Melos, near the great harbour, consisting of part of an amphitheatre, Cyclopean walls, a temple of Aphrodite, and numerous subterranean galleries. It was in this island that was found in 1820 the famous statue of Aphrodite, called the Venus of Milo, now, and since 1834, in the Louvre at Paris. It is admittedly the loveliest known creation of sculpture, and is either an original or a copy of the predest period of ancient Greek art. The sculptor is unknown, though it is not infrequent to find the island itself in a marvellous manner credited with the authorship of this glorious conception; those who write of the "Venus by Milo" evidently thinking that Milo was a worthy rival of Pheidias and Praxiteles. It is highly probable that the statue is by the latter of these two artists.

**MILLO, TITUS ANNIUS PAPIANUS**, was by birth of the Papian family, but was adopted by his mother's father, an Annii. He was of provincial origin, and rose to be chief magistrate of his native place, Lanuvium, in the Alban Mountains, in B.C. 53. He was a spendthrift, debauchee, and while yet a young man was quite ruined in body and purse. He afterwards joined the senatorial or aristocratic party in the fierce contest for supremacy then dividing the ancient Roman republic; became son-in-law of the Dictator Sulla, and was appointed tribune in 57, when he recalled Cicero (the orator of the aristocracy) from exile, and entered on his life-long struggle for place with the demagogue Clodius. Nothing was too violent for Milo. Suspecting the historian Sallust of an intrigue with his wife he publicly horsewhipped him, for instance. In 53 he stood for the consulship, and Clodius for the prætorship. By this time little restraint was observed, and the rivals went about openly with gangs of gladiators, ready for a fight at any moment. The city was in constant turmoil, and blood flowed freely. On the 20th of February, 52, the two principals met, a scuffle took place, and Clodius was slain. The disorder upon this reached such a height that Pompey the Great was named sole consul to restore tranquillity. Milo was at once impeached by the consul, but he trusted in Cicero's unrivalled skill for his defence. Pompey alarmed the cowardly orator, who could not deliver his carefully prepared speech, and overawed the witnesses by hushing the crowded Forum and the hills overlooking it with armed legionaries. Milo was condemned and went into exile (52). In 48, after Cæsar was in supreme power, but during his absence from Italy, the aristocratic enemies of the government of the great democratic dictator invited Milo to return, knowing him violent enough and bitter enough to dare anything. Collecting a band of runaway slaves and released criminals Milo overran the south of Italy, endeavouring to clear it of Cæsar's partisans. He was slain while attacking a fortress.

**MIL'REIS** is the unit of value in Portugal, 1000 *reis*. The milreis of gold weighs 1·7735 grammes, ·9166 fine, and is therefore worth a little over 4s. 5½d. (53·284d.); the actual coin being the *coroa*, or crown, of ten milreis, equal to nearly £2 4s. 5d.

The milreis of Brazil is worth about half of that of Portugal in its gold form, namely, 2s. 3d. with a small fraction (26·48072d.); but a very debased paper currency is the circulating medium, and a paper milreis is worth only about 1s. 8d., varying somewhat with the exchange of the day.

**MILTIADES**, the victor of Marathon and saviour of Greece (and of Europe), was son of Kimon and "tyrant," or absolute ruler, of the Thracian Chersonesos, the peninsula which forms the northern shore of the Hellespont. When the Persian king, Darius, son of Hystaspes, crossed to Europe and invaded Scythia, Miltiades, his ally, was left in charge of the bridge over the Danube, the sole link with civilized Europe. The agreed time elapsed, Darius was given up, and Miltiades vainly sought to induce the Greeks

to break up the bridge. He completed his alienation of the Persians by several successful expeditions which he made in the pay of Athens upon the Ionian Islands. When the great invasion of Greece took place he had to fly from the Chersonesos before the angry Persians. Athens received him, and elected him one of the ten generals of the small force assembled to withstand the Persian hosts.

In the discussions on the plan of campaign Miltiades stood almost alone at first in desiring to come to a battle. Finally, he got four of his colleagues to join him, and as one of them was the commander-in-chief he thus gained the casting vote. Each general commanded one day in turn. Miltiades waited till his day came, and then drew up on the plain of Marathon. The Athenians held somewhat higher ground than the Persians, but the precise position has never been exactly determined. Neither is the number of the Persians actually engaged known, though if their total force was in action they must have had between 150,000 and 200,000 men. The Greeks had 10,000, and were without horse or bowmen. Miltiades therefore at once charged in force, to come to close quarters, all the Greeks shouting their *paian* or war-cry. The wings held good, but the centre broke; as we know that the centre was made very thin, perhaps this entered into Miltiades' plan of battle. At all events he took every advantage of the Persians as they pursued the flying Greek centre, being exposed on both flanks, utterly routed them, drove them to their ships, and destroyed seven of the latter. Six thousand Persians fell, and 192 Greeks; the latter were buried in triumph under a mound which still exists on Marathon.

The enthusiasm at Athens knew no bounds, since this was the first check to the Persian arms, hitherto invincible. Miltiades asked for seventy ships on secret service against Persia. They were at once given him. He used them for purposes of private revenge, attacking the island of Paros. On his return he was very properly impeached and condemned. On account of his services a fine, amounting to the expense of the expedition, was imposed. He could not pay this, and died in prison of his wounds.

**MILTON, JOHN**, one of the most illustrious names in English literature, and the author of the greatest epic poem in the English language, was born in Brad Street, Cheapside, London, 9th December, 1608. His father, who bore the same name, was the son of a Richard Milton, a sturdy Roman Catholic yeoman of Stanton, St. John's, who disinherited his son for embracing Protestantism. Compelled thus to leave Christ Church, Oxford, and abandon hopes of a collegiate career, he had removed to London and established himself as a scrivener and conveyancer, an avocation in which he prospered abundantly, and acquired a modest fortune. He was a man of culture and refinement, and enjoyed a good reputation as a musician in his day. By his wife Sarah Jeffrey he had six children, of whom only three survived—his daughter Anne, and his sons John and Christopher. He gave his son John a liberal education, as the poet afterwards testified:—"From my first years, by the ceaseless diligence and care of my father (whom God recompense), I was exercised to the tongues and some sciences, as my age would suffer, by sundry masters and teachers, both at home and at the schools." After attending St. Paul's School, where he composed among other exercises two metrical versions of the 114th and 136th Psalms, which have been preserved, he was entered a student of Christ's College, Cambridge, in February, 1625. Here he remained until July, 1632, taking his B.A. in January, 1629, and his M.A. just before leaving college. In addition to the regular Latin and Greek of the university he had diligently studied Hebrew, French, and Italian, acquiring a fair reputation with the authorities, and being nicknamed "The Lady" by his associates, from the grace of his personal appearance and the sternness of his morals. To this period belong several Latin essays and



epistles, with the greater number of his preserved Latin poems, and in English the poems "On the Death of a Fair Infant" (1625-26); "At a Vacation Exercise in the College" (1628); the magnificent ode "On the Morning of Christ's Nativity" (1629); "The Passion," the "Song on May Morning," the verses on "Shakspeare," and the quaint pieces on the "University Carrier" (in 1630); an "Epitaph on the Marchioness of Winchester," the sonnet "To the Nightingale," and the sonnet "On arriving at the Age of Twenty-three," belong to 1631.

At the time he quitted Cambridge his father, who had retired from active business, had taken a country house at the village of Horton, in Buckinghamshire, and Milton, who had abandoned his original intention of becoming a clergyman, spent the next six years of his life chiefly under his father's roof, devoting himself to the assiduous study of Greek and Roman literature, varied by mathematics, studies in physical science, and music, the instruments most favoured by him being the organ and the bass viol. Thus pleasantly circumstanced, enjoying in his learned leisure communion with the master-minds of antiquity with the pleasures of rural life, his seclusion being varied by frequent visits to London and intercourse with his friends there, he formed many schemes for future labour and composed the best of his minor poems. It is to this period belong the exquisite companion pieces, "L'Allegro" and "Il Penseroso," of which Dr. Johnson remarks most justly, "Every man that reads them reads them with pleasure;" the fragment called "Arcades;" and the magnificent masque of "Comus," which was performed before the Earl of Bridgewater at Lindlow Castle in 1634. The shorter pieces, entitled "At a Solemn Music," "On Time," and "Upon the Circumcision;" three of the Latin "Familiar Epistles" were also composed at this time, and in November, 1637, he commemorated the loss of his college friend, Edward King, in his pastoral monody of "Lycidas," which was published in a collection of obituary verses in 1638 at Cambridge. Milton's mother died 8rd April, 1637, but his brother Christopher and his wife having taken up their abode at Horton, he took advantage of the opportunity to start on a foreign tour, and in 1638 set out for Italy. His journey lasted for about fifteen months, during which he visited Paris, Genoa, Leghorn, Pisa, Florence, Rome, and Geneva, making the acquaintance of some of the most distinguished men of the time, and gaining favour everywhere by his scholarship and ability. He returned to England in the summer of 1639, but did not take up his residence with his father, who was about giving up his house at Horton, and after some temporary lodgings in St. Bride's Churchyard, Fleet Street, he took a house in a garden, in Aldersgate Street, and began work as a private schoolmaster. His pupils were chiefly the children of relatives or well-to-do friends, and he appears to have always had a liking for the honourable work of school teaching. But public affairs also claimed his attention, for the struggle between the King and the Parliament was now reaching a crisis, and Milton, who thought and felt very strongly on the subject, was soon in the thick of the strife. It was carried on very largely by means of tracts and controversial pamphlets, and Milton's hand is first discerned in the celebrated pamphlet published in reply to Bishop Hall, under the name of "Smectymnus," from the initials of the Puritan ministers, Stephen Marshall, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstowe, who assisted to write it. He afterwards issued independently five other pamphlets bearing upon the controversy, the most important being entitled "Of Reformation touching Church Discipline" (1641), and "The Reason of Church Government" (1642). In 1643 Milton married Mary Powell, a young lady in her eighteenth year, a member of a Royalist family of Oxford's line, but the union proved an unhappy one. The change from the

cheerful surroundings of her father's home to the grave simplicity of her husband's, proved very distasteful to the young wife, and about two months after her marriage she obtained leave to pay a visit to her parents, and then refused to return. Milton forthwith published in the course of 1644 and 1645 four treatises on the doctrine of divorce, in which he urged that the notion of a sacramental sanctity in the marriage relation was a clerically invented superstition, and claimed the right of divorce for a husband who was deserted by his wife. These works naturally aroused a storm of opposition, and an attempt was made to bring him within the range of the law, on the ground that these pamphlets had not been licensed or registered. This drew from him in November, 1644, one of the noblest of his prose writings, entitled "Areopagitica, a Speech of Mr. John Milton for the Liberty of Unlicensed Printing." In August, 1645, a reconciliation was effected between him and his wife, and she afterwards bore him three daughters—Anne, Mary, and Deborah—dying in childbirth with the last in 1653. In 1645 he published a collection of his poems in English and Latin, and about this time commenced the preparation of a complete history of England, a system of divinity drawn from the Scripture in Latin, and a Latin dictionary. After the execution of Charles I. Milton published a pamphlet entitled "Tenure of Kings and Magistrates," in which he boldly defended the step that had been taken, and shortly afterwards he was appointed secretary for foreign tongues to the council of state of the Commonwealth, at a salary of £288 a year, equal to about £1000 at the present day. This position brought him into close contact with all the leaders of the republic, and in the pursuit of his duties he was called upon to pen some of the noblest state papers ever authorized by an English government. Some hundred and twenty official Latin letters, written or dictated by him, remain to us, but these are thrown into the shade by his literary works in defence of the republic. The first of these, a pamphlet on the "Articles of Peace between the Earl of Ormond and the Irish Rebels," appeared in May, 1649, and in the latter part of the same year he published his "Eikonoklastes," in reply to the celebrated "Eikōn Basilikē," attributed to Charles I., but really written by Dr. John Gauden. At the end of this year there appeared on the Continent a work entitled the "Defensio Regia pro Carolo I.," by Salmasius or Claude de Saumaise of Leyden, a man who enjoyed the reputation of being the greatest scholar of Europe. The duty of replying to this was intrusted to Milton, and in 1651 he issued a crushing retort in his "Pro Populo Anglicano Defensio," a work which attracted great attention on the Continent, and did much towards raising the influence of the British republic. His eyesight, however, which had long been weak, failed him altogether soon after the publication of this work, and in 1652 he became totally blind. He still, however, continued his duties as secretary, dictating the letters he was unable to write, and he published his "Defensio Secunda pro Populo Anglicano" in 1654, in reply to a pamphlet published at the Hague, entitled "Regii Sanguinis Clamor." In this work, and in the two other pamphlets by which it was followed, Milton fiercely attacked the supposed author of the "Regii Sanguinis," Alexander Morris, the real author being, however, Dr. Peter du Moulin. In 1656 Milton married a second wife, one Katharine Woodcock, but she died in childbirth fifteen months afterwards, her child dying with her. In 1657 Andrew Marvell was associated with Milton in the duties of the secretaryship, but it fell to Milton to compose some of the most important despatches of Cromwell to Louis XIV., Mazarin, and Charles Gustavus, in 1658. The death of Cromwell in September, 1658, left the protectorship to Richard Cromwell, under whom Milton continued to serve, and no man struggled more manfully than he did to preserve the Commonwealth and prevent the return of



Charles II. Even as late as April, 1660, he issued a pamphlet fiercely denouncing the royal family, and when in the May of that year Charles II. made his entry into London, Milton found it necessary to conceal himself in the house of a friend in an obscure part of the city. It is not clear how he escaped the vengeance of the Royalists, but when the Act of Oblivion was passed his name did not appear as one of the exceptions, and though for some reason not recorded he was taken into custody by the sergeant-at-arms of the House of Commons, he was released in December, 1660, and was never afterwards molested. Between 1661 and 1664 he resided in seclusion in a house in Jewin Street, visited by a few faithful friends, and busy with certain literary projects which had remained suspended during his official career. He seems to have been peculiarly unhappy in his domestic arrangements, and his three daughters, whose education he had neglected, and to whom he appears to have been a stern parent, failed to render him the willing obedience he required, so that he married a third wife, Elizabeth Minshull, in 1663. In the last year of Cromwell's protectorate he had commenced his greatest work, "*Paradise Lost*," the composition of which appears to have been completed before July, 1665, for when in that month he went with his family to the village of Chalfont, St. Giles, Buckinghamshire, he allowed his friend Thomas Ellwood to see the work in MS., and to take away a copy for perusal. It was first published in 1667, the copyright being purchased by Samuel Simmons, a printer of Aldersgate Street, for £5 down, a promise of another £5 after the sale of a first edition of 1300 copies, and the further promise of two more payments of similar sums if two more editions were called for. It was as if an author now were to part with all his rights in a volume for £17 10s. down, and a contingency of £52 10s. more in three equal instalments. The poem seems to have been very well received, for by the end of two years all the copies of the first edition were sold, and its fame brought him numerous visitors, "much more than he did desire." He is described at this period of his life as being led about the streets, a slender figure, rather under middle stature, looking younger than he really was, but evidently in feeble health. By his biographer Richardson, he is described as "sitting before his door in a gray coat of coarse cloth, in warm, sultry weather, to enjoy the fresh air; and so, as in his own room, receiving the visits of the people of distinguished parts as well as quality." He suffered much from gout in his later years, but seems to have retained a fair measure of cheerfulness, and to have found relaxation in music. His literary labours were still maintained with unabated vigour, and in 1669 he published his "*Accedence Commenced Grammar*;" in 1670, his "*History of Britain to the Norman Conquest*;" and in 1671 the two poems, "*Paradise Regained*," and "*Samson Agonistes*." In 1673 he issued his last political pamphlet, under the title of "*True Religion, Heresy, Schism*," &c., a mild and temperate version of the opinions he had vehemently expressed before, and a second edition of his minor poems. He died from gout-fever, 8th November, 1674, at the age of sixty-six, and his body was buried in the Church of St. Giles, Cripplegate, beside that of his father, 12th November, 1674.

As a poet Milton has earned for himself an imperishable fame. His great epic attains a sublimity of thought and a grandeur of style worthy of its theme. To say that it has defects is to say that it is human, but what other poet ever essayed so noble a flight, and soared above so long? In modern epic literature it stands unrivalled, and it can be compared with no other work except the great poem of Dante. In his minor poems, though less lofty, he is not less admirable. The harmony of his numbers, the richness of his imagery, the beauty of his language, his fine sympathy with all that the world contains of the lovely and delightful, must ever command the suffrages of impartial

rites. Their catholicity is also a conspicuous feature. The stern, austere republican is nowhere visible; the formal Puritan wears the laurel and the blossom-wreath of Italian bards. He has an eye for the "studious cloister" and the "storied window;" his fancy loves to dwell upon "throngs of knights and barons bold;" his ear listens well pleased to "the merry bells" and the "jocond rebecks;" or to the "full-voic'd quire," whose sweetness "dissolves him into ecstasies." For beauty everywhere, or at least for such beauty as is of a sensuous and ideal character, Milton has the poet's eye and heart.

As a prose writer Milton has received the energetic praise of Macaulay, who asserts that his works "abound with passages compared with which the finest declamations of Burke sink into insignificance," and that they must be studied by every man who wishes to become acquainted with the full power of the English language. As a matter of fact, however, they have for the most part remained unread except by scholars, and their style is strangely out of keeping with the taste of the present day. It by no means follows, however, that this is the fault of the writings themselves, for modern English prose will hardly compare favourably with the grander and more elaborate style of some of the old masters; and it may be that a future generation will honour in Milton the great thinker, the fervid controversialist for the cause of freedom and self-government, and the writer of a lofty, rhythmic, and impassioned prose, as well as the poet of unquestioned eminence.

Of Milton's poems over 150 editions have been published, while his biography has been written by Toland, the two Richardsons, Birch, Bishop Newton, Dr. Johnson (in the "*Lives of the Poets*"), Dr. Symmons, and Dr. Todd. All these biographies, however, have been surpassed by the monumental work of Professor Masson, the publication of which, extending over twenty years, was completed in 1880. An edition of the poetical works of Milton has also been prepared by the professor, which appeared in 1874 (3 vols., Cambridge), a second edition being issued in 1882. There have also been several editions of Milton's prose writings, one of the latest being that issued in Bolin's Standard Library (five vols., 1848-53). A "Selection," with an introductory essay by Ernest Myers, was published in London in 1884. A fac-simile of the original edition of "*Paradise Lost*" was published by Elliot Stock in 1877.

**MILWAUKEE**, the most populous town of Wisconsin state, United States, stands on the west shore of Lake Michigan, 80 miles north of Chicago, and 75 miles east of Madison. The site is partly the flats bordering the river of same name, and partly bluffs 100 feet above it. The Milwaukee approaches from the north, and the Menomonee coming from the west joins it a mile from its mouth. Both streams are navigable for small vessels about 2 miles up, and the harbour is deep and roomy, one of the best of the entire lake navigation. It is a handsome town. The brick used for building is of a pleasing cream colour, and little affected by weather; it is made in large quantity, and is an important article of export. The whole town is beautifully planted with trees, and the climate is very genial. It possesses a home for disabled soldiers, a fine park, a public library, numerous churches, religious, charitable, educational, and social institutions, and extensive warehouses and business offices. It is the centre of a large railway system, has a great and increasing trade in pork, metallic ores, &c., and after Chicago is the greatest grain market of the Union. The population in 1880 was 115,578, and contained a large German element.

**MIMETITE** is an arseniate of lead with a certain proportion of chloride ( $3(\text{Pb}_2\text{As}_2\text{O}_6) + \text{PbCl}_2$ ). It is closely allied to pyromorphite, the arsenic acid replacing the phosphoric acid. It occurs associated with lead ores in many localities, but is seldom of any commercial importance, and is of interest rather as a perfect example of isomorphism.

It receives its name from the Greek *mimētēs*, a mimic, from its close resemblance to pyromorphite, from which it is difficult to distinguish it.

**MIM'ICRY**, in biology, is a metaphorical expression for the advantageous external resemblance of one species to another. The word was first used by Mr. Bates, and the biological facts which it expresses have been exhaustively studied by Mr. Wallace, who deals with the question in his "Contributions to the Theory of Natural Selection."

The phenomenon to which the term mimicry is applied may be stated in general terms as follows:—Certain species of animals being themselves edible, and belonging to groups which are attacked and devoured by numerous enemies, obtain protection by their close resemblance to some of the brightly coloured species which are free from attack on account of some special means of defence, as a nauseous odour or taste, a sting or an indigestible hardness.

The best examples of mimicry occur among some tropical families of butterflies. The *Heliconiidae*, which are extremely numerous in tropical America, are all showy, brilliant, slow-flying butterflies, but according to Mr. Bates they are never eaten by birds and lizards like other butterflies. Their immunity from attack is no doubt due to the fact that their tissues are pervaded by a yellow secretion, which possesses a peculiarly pungent odour, and gives them a nauseous taste. Their larvæ and pupæ also possess the pungent yellow secretion, so that these butterflies escape destruction in all their stages of existence. It is evident that it is advantageous to these incredible species to become as conspicuous as possible, so that they might not be hunted and maimed. Having, then, vast numbers of conspicuous inedible butterflies flying in the woods, it will be readily seen what an advantage in the struggle for existence would be gained by a rare species of butterfly, which, inhabiting the same region and being without any special protection, acquired sufficient superficial resemblance to the protected species to be mistaken for them by birds and lizards. Now this is exactly what occurs. In the same forests with the *Heliconiidae* are found butterflies belonging to a totally distinct family, *Pieridae*, most of which, like their English representatives, the cabbage and bluestone butterflies, are white or yellow. But some species of *Leptalis*, a genus of *Pieridae*, so exactly resemble particular species of the *Heliconiidae* in the peculiar shape and colouring of their wings that experienced entomologists like Mr. Bates and Mr. Wallace were constantly deceived. The mimicking species was always found in the same district, and flying with the species which it mimicked, and was far rarer in individuals. But as the mimicking species was no more protected in its larval and pupal conditions than the other *Pieridae*, an increase of numbers sufficient to endanger the success of the imitation would be prevented. This theory of mimicry does not of course imply a *conscious* imitation by one species of the appearance of another, but that any variation in the direction of a resemblance to a specially protected group would be fixed and intensified by natural selection. Natural selection would from time to time exert a tendency to make the inedible imitated species more and more conspicuous, and *pari passu* increase the mimetic resemblance of the imitator.

In the tropics of the Old World two families of butterflies, *Danaidae* and *Acraeidae*, nearly allied to *Heliconiidae*, are mimicked by butterflies belonging to species of *Papilio* and *Diadema*. In some of these cases the females alone, owing to their greater need for protection, are mimics. In one species, *Papilio merope*, there are three distinct female forms, each mimicking a particular species of *Danaia*, and differing in appearance from each other and from the male insect. In our own country the clear-wing moths of the family *Egeriidae* mimic bees, wasps, and ichneumon-flies, which are protected from attack by their stings. Mimicry is far from uncommon among beetles, especially in the group

*Longicornia*. The soft-bodied beetles forming the group *Malacoderini*, of which "soldiers" and "sailors" (*Telephorus*) are examples, are protected by a nauseous taste from the attacks of birds; and these are mimicked by species of *longicorns*. Other tropical *longicorns* present a mimetic resemblance to certain weevils, which have the surface of the body so hard that it cannot be pierced by a bird's beak. Other *longicorns* again mimic bees, wasps, sawflies, and ants. Wasps and bees are also mimicked by species of two-winged flies of the order *Diptera*. There are certain parasitic flies belonging to the genus *Volucella* whose larvæ feed on those of bees; and these so exactly resemble the particular species of bee upon which they prey that they enter the bee's nest undetected, and deposit their eggs. A few instances of mimicry occur in the vertebrate sub-kingdom, especially among birds. In Australia and the Moluccas species of *Mimeta*, a genus of *Orioles*, occur together with the friar-birds (*Tropidorhynchus*) and mimic them, thus obtaining the advantage of the respect which the bold pugnacious character of the friar-birds inspires in their common enemies.

**MIM'IR**, God of Wisdom, in the Norse mythology, dwelling by the tree Yggdrasil, and drinking daily of the spring of wisdom which flows from among its roots.

**MIMO'SA** is a genus of plants belonging to the order *LEGUMINOSÆ*, and giving its name to an important sub-order, *Mimoseæ*. In this suborder the flowers are regular and quite small; the calyx is gamosepalous or partite in a valvate manner; the petals are valvate, generally connate below the middle; the stamens are free or monadelphous. The genus as at present limited by Bentham and Hooker, contains about 230 species, which are chiefly natives of the warmer parts of America, a few being found in Africa and Asia, but none in Australia, where *Acacia* takes its place. The calyx is inconspicuous; the stamens are the same in number as the petals, or twice as many; the valves of the ripe pod fall away, leaving the rim persistent on the stalk. The species are herbs or shrubs, sometimes climbing, and rarely trees. The flowers are in globular heads or in spikes. The leaves are bipinnate, with a large number of leaflets, which are very often sensitive. The leaves of all the species sleep at night, that is, the opposite leaflets come into contact, and point towards the apex of the leaf, and the whole leaf hangs down. The upper surfaces of the leaflets are thus covered, and according to Darwin ("Movements of Plants") "the benefit thus derived is the protection of their upper surfaces from radiation into the open sky, and in many cases the mutual protection of all the parts from cold by their being brought into close approximation." The petioles also rise during night, and Darwin, speaking of these and other cases, says, "It may be strongly suspected that in some cases the rising of the petioles, when considerable, does beneficially serve the plant by greatly reducing the surface exposed to radiation at night." The same kind of motion takes place when the leaf is touched, but the movement is much quicker. Professor Burdon-Sanderson has shown that an electrical discharge takes place in the plant tissue, just as when an animal muscle is excited. The dropping movement of the leaf-stalk is caused by the discharge of water from the cells on the lower part of the "joint" between the stalk and the branch, and a similar explanation applies to each of the minor movements.

**MIM'US** or **MIME** (whence our *pantomime*), a rough dramatic representation among the Greeks and Romans of farcical interludes. The Greek *mimoi* were in *Doio* prose, the better to give a rustic rudeness to the dialogue; the Roman *mimi* depended more on gesture and horseplay, and far less on dialogue, and curiously enough such buffooneries were the favourite exhibitions at funeral ceremonies. They served also as afterpieces to the tragedies. They were not very decent oftentimes, and it does not

speak well for Roman taste that they were always in greater favour than the legitimate drama. The actors in minnes dressed absurdly, but wore neither high shoes (sock and buskin) nor masks.

**MIN'ARET** (from the Arabic *menerah*, a lantern), a tall, slender, shaft-like tower, rising high into the air beside the mosque, and bearing a gallery at its summit, whence the *muezzin* (crier) summons the faithful at the appointed times to prayer.

**MIND**, in its highest development, may almost be limited to man. But in its lowlier forms it is known to extend through all the animal kingdom, at least as far down as the Medusa, and who shall say to what limit further discoveries shall enlarge its extension?

We are sure that inanimate nature is entirely non-sentient, and we may without difficulty assure ourselves that plants are also, in the proper sense of the word, non-sentient; for the examples of the sensitive plant, shrinking from the touch, and of the *Drosera* and *Venus's flytrap*, which close round morsels of flesh or imprison hapless flies and devour them, are not truly to be taken as showing mind even in its humblest form of unconscious reflex action upon a sensation; but they resemble rather the action of chemical affinity, or the selective power of the magnet which draws to itself iron fragments, and those only, from a mixed mass of filings of all metals. The requisite combination being provided, chemical union or molecular motion takes place, and that is all.

So in the lowest animals, such as the formless Amoeba, mind is probably not present, although the creature gropes towards its food and absorbs it into its structureless body, or flows round it rather, a like molecular stimulus being sufficient to explain the operation. But when we find the medusa (of which the jelly-fish is a common type) responsive to a local stimulus, so that the Tiaropsis, for instance, moves its polypite (a long funnel-like body which hangs down from the main hemisphere or "bell" of the creature, and serves as its stinging apparatus and its mouth), to any part of the bell which has been touched, and continues to move it as other parts are touched in turn, we are face to face with a distinct reflex action, a response of a lowly mental character to an external stimulus. On examination a peculiar kind of tissue, called nerve-tissue, is found to exist in this medusa, and extended experience has shown us that the presence of nerve-tissue is the physical condition necessary for any manifestation of sensibility whatever.

As organisms increase in sensibility their power of discriminating between various kinds of stimulus increases, and the muscular responses will vary with the sorts of stimulus received. This will call for a differentiation of tissue, and this latter in its turn will increase the power of distinguishing between various sorts of stimulus. Thus the forms of creation rise from the medusa with its one sense of touch, its one unconscious form of feeling, and its one kind of tissue, to the man with his six (or more) senses, his many forms of mental action, and his numerous and complex tissues. But in this vast scale three well-defined mental stages are discoverable; the lowly medusa has a mere simple reflex action, wholly unconscious as we believe; higher forms have as well as this a far more complex mental action which we call *instinctive*, and in the highest organisms we find not only these two but a still further advance in complexity to what we term *intelligent* actions. Man, the most intelligent of all animals, still possesses, in addition, many instinctive traits and many more simply reflex. What is important to notice is that, nowhere in the long chain can we find any definite break; nowhere can we pause and say, "Here begins the true mind, the true intelligence and below this mere nervous action, unconscious, non-mental, exists." Man shares his nature with the medusa, blinks at a bright light by the self-same unconscious action as that which moves the polypite of the Tiaropsis, and all

he vast machinery of his mind is built up upon this foundation. He stands at the head of an innumerable series of imperceptible steps, ascending in many various ways through the whole wide vault of creation's mighty arch.

The human mind, as we know it in its completeness, seems a coherent unity in each one of us. We can examine its workings by introspection and by observation of others; but we cannot discern its nature. Philosophy or metaphysics has sought in vain to arrive at the solution of this problem during many centuries. We mark off mind from matter [see MATTER], and it is a convenient distinction; but at the same time we admit that we know of matter only through its effect on our mind, and *vice versa*, that every mental action is accompanied with a molecular motion of matter—namely, of our nervous tissue. When we see, there is no doubt that the nervous irritation of the retina precedes the perception of light by the mind; and when we walk there is equally no doubt that the action of the mind precedes the irritation of the nervous tissue, which stimulates the motion of the leg. We have come to believe, after much study by careful observers, that most of our reflex actions are due to the action of the sympathetic nervous system and the spinal cord of the cerebral system; that most or all of our *instinctive* actions are due to the great ganglia at the base of the brain; and that the whole of our *intelligent* action is due to the hemispheres of the brain. We call the brain, therefore, using mind in a sense limited to its highest manifestations, "the organ of mind." Phrenologists have sought even to subdivide the brain into regions of special mental characteristics—that is, into so many little brains, each one having its own phase of mind, one for colour, one for space, one for memory, &c.; but this theory has for some years been quite discredited among competent observers. On the other hand, it seems increasingly likely that some special functions will be eventually localized in different parts of the brain. (See Dr. Ferrier on "The Functions of the Brain," London, 1876.)

How mind and matter are united, or whether they are at bottom the same or different substances or existences, has not been determined. We observe that mental life runs parallel with material life; every thought is accompanied with waste of brain tissue, and *vice versa*. Hence a school has arisen which explains mind by *materialism*, saying that the material body is the one substance and active principle of which mind is one of the special activities; while, on the other hand, an opposing school holds to *spiritualism* (the philosophical use of the term being here meant), and says that the material body is of itself inert, and is only informed with life and activity by a spiritual principle. Finally, the desire to meet what seems real in each of these opposing views has given rise to *monism*, the doctrine that matter and mind are only two attributes of the same substance, two sides of the same shield, or differing but as the convex and concave faces of the same curve. This question of the inner nature of mind doubtless derives more importance than it should otherwise possess (since it belongs to the region of the probably unknowable), from its connection with the universal hope of the immortality of the soul. If mind *cannot* exist apart from matter, personal immortality would seem impossible; but fortunately that is not proved. What is proved is that in *this world* mind *does not* exist apart from matter, a conclusion widely separated from the above.

Meanwhile, for each man there is at least one distinction clear and obvious—namely, the distinction between *subject* and *object*, between the *me* and the *not-me*. And, moreover, we can study mind either in the *me* by observing our own thoughts and sensations, or in the *not-me* by observing, so far as we are able, the same things in the mind of others. Neither of these methods is in itself sufficient; for an exclusive attention to our own mind would not give us a knowledge of mind in general; and, on the other hand,

since we can observe others only by their external manifestations, these are in themselves, as it were, words in an unknown tongue, only valuable after interpretation by our own thoughts and feelings.

Analyzing mind, we find it divisible into three classes of phenomena—those of *FEELING*, those of *WILL*, and those of *thought or INTELLECT*; and the class *feeling* is subdivided into *SENSATION* and *EMOTION*. This classification is due mainly to Moses Mendelssohn, and to Kant after him, and is now practically adopted as exhaustive. The department of *feeling* includes all our pleasures and pains, sensation taking the physical, emotion the mental side; that of *will* includes all our actions, except the unconscious ones due to reflex or instinctive impulses; that of *thought or intellect* includes perception, memory, conception, abstraction, reason, judgment, and imagination, and is found to rest upon three fundamental powers or functions—namely, the consciousness of difference, the consciousness of agreement, and the power of memory. Most of these departments and of their included properties of the mind are fully treated of in separate articles, to which the reader is referred. It is only necessary here further to observe, that the mind seldom, if ever, operates exclusively in any one of its departments. A volition or act of will always arises from feeling or thought, a feeling is nearly always accompanied by will or desire and by thought, and so on with the other instances. On the other hand, as we have seen in this brief survey, sensation is the lowest department of mind, extending far below consciousness or mind proper, and may be regarded as the primary department of feeling; the intellect may be regarded as chiefly growing out of this; the emotions as growing out of the intellect acting upon sensations; and the will as derived from the intellect, especially the memory, being controlled throughout by one of the two branches of feeling.

**MINDEN**, a town of Germany, in the province of Westphalia, Prussia, and the capital of the government of the same name, is situated 37 miles by railway W. from Hanover, on the left bank of the Weser, here crossed by two bridges. It is one of the oldest towns in Germany. The streets are narrow and irregular; the old-fashioned houses are in general built of stone or brick. The Domplatz, or cathedral-close, is a handsome square planted with trees. Among the public buildings, the largest and handsomest is the Roman Catholic cathedral, which was completed in 1072; it is built in the lower part of the town, on a foundation made with piles. There are also Lutheran, Roman Catholic, and Calvinist churches. The fortifications have been greatly improved since 1815, and there are some barracks. Besides the gymnasium and a seminary for schoolmasters, there are several public schools, hospitals, and other useful institutions. The manufactures are woollen stuffs, linen, hosiery, tobacco, sugar, vinegar, beer, and brandy. In the vicinity there are oil and saw mills. The population of the town in 1881 was 17,867. The French were defeated near Minden on the 1st of August, 1759, by an Anglo-Hanoverian force under Prince Ferdinand and Lord George Sackville, the latter of whom was afterwards deprived of all his commands for alleged cowardice and incapacity.

**MINERAL DEPOSITS** are the various accumulations of ore of economic importance found in the crust of the globe. They are usually formed of associations of minerals in a more or less highly crystalline condition, some metalliferous, which constitute for the most part the ore; others are earthy, forming usually the gangue. Several modes of classifying these deposits have been proposed; none of them, however, are quite free from some objection, and are adopted chiefly for convenience. Broadly, they may be divided into *superficial* and *inclosed deposits*.

*Superficial deposits* usually result from the disintegration, transport, and accumulation in a more concentrated

form of the material from inclosed deposits. The most important of this class are the placers or alluvial deposits wherein tin, gold, platinum, and other heavy metals accumulate. In some exceptional cases superficial deposits are formed by chemical precipitation; such are the bog iron and lake ores. To these also may be added such accumulations as the Tŷf copper mine formerly worked in Wales.

*Inclosed deposits* are the most abundant of our metalliferous minerals, though seldom as rich as the superficial accumulations. Of them there are several distinct forms that have evidently originated in various ways. The first to be noticed are *beds or stratified mineral deposits*. These have evidently been formed contemporaneously with the adjoining strata. In some instances particular porous beds appear to have been invaded subsequently by a solution bearing mineral matter which was deposited. Such deposits, however, belong properly to a class which are termed *impregnations*. The minerals mostly found in beds are several of the iron ores, such as the ironstones of the coal measures and the various oxides found in thick beds in some highly metamorphosed rocks. Copper ores occur in the Kupferschiefer of Mansfield, Saxony; and at Alderney Edge, in Cheshire, a sandstone impregnated with carbonate of copper has been extensively worked.

*Lodes* are the deposits that furnish most commercial ores. They have been formed subsequent to the deposition of the inclosing strata, and are the filling up of fissures formed in the rock. The theories as to the formation of these metalliferous deposits are very various, but it appears that after the formation of the fissures, they became the channels—probably at a great depth beneath the surface of the earth—of thermal waters, bearing mineral matter in solution, and possibly to some extent in suspension: these became precipitated by the cooling of the solution, or by release of pressure as they ascended, and in other cases by the reaction of solutions from the adjoining strata. Sometimes the deposit occurs at the junction of two kinds of rock; it is then considered as a *contact deposit*. Usually the country rock adjacent to the lode is affected and mineralized, sometimes to such an extent as to be workable for the ore; this is termed the *capel*. Abundant instances of lodes are to be found in all mining districts, their contents varying greatly. The various phenomena connected therewith cannot be noticed here, but may be found fully treated of in the various special works on this subject. Of the other veins may be mentioned *gash veins* and *segregation veins*, which are usually filled from the adjoining strata.

Of *irregular deposits* not included among the preceding varieties there are a great number; these may be mass deposits or large pockets, occupying cavities in certain strata. Of such a nature appear to be the masses of hematite found in limestones, and bunches of galena and other ores found in some districts. *Stockwork* is a German term applied to a deposit containing numerous ramifying small veins of metalliferous stuff. *Impregnations*, as the term implies, are deposits containing disseminated metalliferous substances. They have probably been formed by the rocks having been subjected to a solution from which the metalliferous minerals were deposited.

**MINERAL WATERS**, the name usually given to all spring waters which contain mineral ingredients in larger quantities than the ordinary drinking water. Springs of this kind are found in most of the countries of the world, and their use as remedial agents dates from a very remote period. By the old Greek physicians they were specially favoured, and according to one tradition the temples of *Æsculapius* were usually erected in proximity to a mineral spring. To the Romans we are indebted not only for the discovery of the thermal mineral springs of Italy, but also of those of many other places in Europe; and Pliny, in his "Natural History," mentions a large number of them, and rightly

observes, that the waters are such as the soil through which they flow. The therapeutic action of mineral waters depends chiefly upon their chemical constitution, and for medical purposes they are used either externally or internally, for bathing or for drinking, or both methods are employed in combination. Formerly it was believed that when persons bathed in the water of the warm mineral springs the ingredients in solution were absorbed into the system through the pores of the skin; but at present the more generally received opinion is that their action is limited to their stimulating influence upon the skin, and is not greatly different from that of ordinary water. Many of them, however, have a good local reputation as remedial agents when used in this way, and steel baths in waters containing iron, mud baths made with peat-earth stirred up in water, pine-leaf baths made of extract of the fresh leaves of the *Pinus sylvestris*, with several others, are used in Germany and elsewhere for the cure of disease. In most of the continental bathing-places the action of the waters is largely assisted by the pure mountain air of the neighbourhood, and the regulations as to diet, rest, and outdoor exercise enforced by the proprietors under the direction of the local physician. It is because these important adjuncts of rest, change, and recreation are wanting that the use of the waters away from the baths is usually so disappointing.

From the variety of the ingredients found in most of the mineral waters of Europe, all attempts at chemical classification must be more or less imperfect, but the principal classes may be conveniently grouped as follows:—

(1) Simple thermal waters, (2) muriated saline waters, (3) alkaline waters, (4) sulphated saline waters, (5) iron or chalybeate waters, (6) sulphur waters, (7) earthy and calcareous waters.

(1) The simple thermal waters usually contain a small amount of saline or gaseous constituents, and they are chiefly remarkable for their elevated temperature, which varies in the different spas from about 80° to over 150° Fahr. When taken internally their action resembles that of ordinary pure warm water, and they serve to increase the secretions attendant upon digestion, to render the process of tissue change more rapid, and to promote the elimination of effete matter from the system. Used as baths they cleanse and purify the skin, quicken the circulation of the blood, and promote free perspiration. Tepid baths are calming and soothing to the nervous system, while hot baths exercise a powerfully stimulating influence. Among the more important spas of this class are Gastein, Tüplitz, Willbad, Plombières, Warmbrunn, Clifton, and Buxton. They are especially used in cases of neuralgia, chronic rheumatism, hysteria, painful menstruation, and several diseases of the skin.

(2) Muriated saline waters are such as are marked by the presence of a moderate quantity of common salt in addition to other ingredients, and when taken internally they exercise an aperient influence upon the stomach and bowels, as well as that of increasing the secretions of the kidneys; used as baths they exercise a powerfully stimulating influence upon the skin. There are a large number of spas of which the waters come under this description, and in England we have Middlewich, Woodhall, Harrogate, Leamington, and Cheltenham. Some of the waters of this description are known as *brines*, from the large amount of salt they contain, the best known being those of Droitwich in England, Rohme in Westphalia, and Mannheim in Hesse. Such waters are useful for the treatment of gout, rheumatism, scrofula, and abdominal plethora.

(3) The alkaline waters are subdivided into (a) simple alkaline acidulous waters, the chief ingredients of which are carbonic acid and bicarbonate of soda. The most celebrated of these are the hot springs of Vichy and the cold springs of Salzbrunn, Billu, Fachingen, Wilhelmsquelle,

and Geiluan. They are useful as a remedy for certain forms of indigestion, sluggish liver, tendency to gall-stones, renal calculi, and gravel, and chronic catarrh of the respiratory organs. (b) Muriated alkaline acidulous waters, which contain, in addition to the ingredients mentioned, a certain proportion of common salt. The chief springs of this class are those of Ems, Rozat, La Bourboule, which are hot springs; and Selters, Salzbrunn, and Rosbach, the waters of which are cold. These waters are preferred to the former in cases where it is desirable to avoid loss of flesh and to improve the state of the blood.

(4) Sulphated saline waters are characterized by a preponderating amount of the sulphates of soda or magnesia, or both sulphates together. Some of these are widely used as purgatives, and they are specially valuable in the treatment of congestion of the liver and habitual constipation. The best known are those of Carlsbad, Friedrichshall, Hunyadi Janos, Pullna, Epsom, Cheltenham, Leamington, Seidlitz, Tarasp-Schuls, and Bertrich.

(5) Iron or chalybeate waters are a very numerous class, and they are used chiefly for convalescents after severe illness, in many forms of anæmia, chronic neuralgia, and general debility. Some of them contain carbonate of iron and carbonic acid, and these are considered the most easy of digestion. There are several springs of this description in England, the best known being one found at Harrogate, and the spring at Tunbridge Wells. Iron is also found in combination with the carbonates of soda, lime, and magnesia, and the sulphates of soda, magnesia, lime, and common salt. Among the best known waters of this description are those of Orezza in Corsica, Pymont and St. Moritz in the Engadine, Reinerz, Griesbach, and Imman.

(6) Sulphur waters are such as contain either sulphuret of hydrogen or the sulphuret of sodium, calcium, potassium, or magnesium. Of the thermal springs of this description those of Aix-la-Chapelle, Baden in Austria, Baden in Switzerland, Barèges, Eaux-Chaudes, Eaux-Bonnes, and Bagnères de Luchon. Of the cold sulphur waters those of Harrogate in England, Moffat in Scotland, and Lisdonvarna in Ireland, may be mentioned, with those of Eilsen, Meindorf, and Langenbrücken on the Continent. Sulphur waters are mostly used in combined bathing and drinking courses in cases of chronic disease of the skin, rheumatism, gout, congestion of the liver, metallic poisoning, and constitutional syphilis.

(7) Earthy and calcareous waters are such as are marked by the presence of carbonate and sulphate of lime. They act in a soothing manner upon the intestines, and some of them have an excellent reputation as diuretics. Their influence, however, is comparatively slight, and several of them are used as table waters and not for medicinal purposes. The best known are those of Wildungen, Couzan, St. Galmier, and Taunus.

(See "Spas of Europe," by Dr. Althaus, London, 1862; J. Braun's "System. Lehrbuch d. Balneotherapie," fourth edition, Berlin, 1880, and the English translation of this work by Dr. Hermann Weber, London, 1875.)

**MINERALOGY** is the science that treats of those inorganic constituents which make up the mass of the globe and have a definite chemical constitution and crystalline structure. The products of the earth's surface may be broadly classified as either organic or inorganic. The organic world is divided into the animal and vegetable kingdoms; it is composed chiefly of compounds of carbon, oxygen, hydrogen, and nitrogen, and growth takes place by intussusception or assimilation. The inorganic world or mineral kingdom comprises all the elements which, uniting chemically together in definite proportions, form salts, usually assuming a definite form which grows by accretion. The ultimate state to which the inorganic world can be reduced mechanically is to a number of minerals; it is with these that the mineralogist has to deal, while the chemist

investigates the elements which compose these minerals. Minerals bear to the elements a somewhat analogous relation to that borne by the molecules of a substance to the atoms of its constituents. A mineral may be defined as a body formed naturally without the agency of plants or animals, and which is homogeneous and constant both in chemical composition and physical characters. Rocks are formed of an aggregation or mechanical mixture of minerals; and inasmuch as soils, sands, clays, and most other superficial accumulations are formed of disintegrated rock, it follows that they are all composed of minerals, although perhaps in a fragmentary condition. Mineralogy is therefore a complex science; a knowledge of it is essential to the miner and geologist, while for the investigation of the chemical and physical properties of minerals the aid of such sciences as CHEMISTRY, CRYSTALLOGRAPHY, optics, heat, electricity, magnetism, &c., is requisite.

Most minerals are solid at the ordinary temperature of the earth; there are, however, a few exceptions. Thus mercury is a liquid, but it solidifies in polar regions; water, too, is a liquid, but it freezes or becomes solid at a not very low temperature. Most other liquids are mixtures or solutions (generally in water) of other substances; and the fact of water being almost everywhere present, and being a solvent in a greater or less degree for a vast number of substances, modifies considerably the occurrence of solvable minerals on the surface of the earth.

Minerals are more usually chemical compounds, but a few elements occur native or in the free state. These are generally the less easily oxidizable metals, as platinum, gold, silver, mercury, copper, &c., to which may also be added the diamond and graphite forms of carbon, sulphur, and some others of rarer occurrence.

Minerals for the present purpose may be broadly separated into metalliferous minerals and rock-forming minerals. *Metalliferous minerals* are those which have a dominant metallic base that may be isolated with comparative ease by heat and simple reducing agents. This division includes the native metals, and from it our various ores are obtained. Although these minerals are sometimes found disseminated through the rocks, they chiefly occur in certain spaces of comparatively limited extent known as mineral deposits.

*Rock-forming minerals* have mostly an earthy base, usually an oxide, the electro-positive element of which is with difficulty isolated. This division would include not only the common rock-forming minerals, but the various accessory minerals, gems, and precious stones found in segregation veins and drusy cavities of rocks. Silica (quartz) and numerous silicates form the majority of the rock-forming minerals. Carbonates also occur of which carbonate of lime is the most abundant. The other classes of salts are usually of less frequent occurrence.

Minerals may be classified on several principles. The most approved appears to be a chemical system, usually the basic element or metal being taken as the basis of grouping; but in the case of silicates it is difficult to follow this arrangement. Minerals may also be grouped according to their acid radicles, and for some purposes this method of classification is preferable to the preceding. Want of space precludes a discussion here of the various systems of classification: individual mineral species will be found described in their proper place, and some of the great groups are also mentioned.

A mineral is homogeneous in structure: each species possesses a definite form, composition, and external and internal structure, affording mechanical, optical, or other physical characters. The science of mineralogy is built up on a group of principles derived from such sciences as geometry, physics, and chemistry, from which, by extended reasoning and observation, principles proper to itself may be evolved. The fundamental principles of geometry

underlie the science, in that it deals with the boundaries occupied in space by certain forms of matter, and the relation of these boundaries to each other. The characters of the matter occupying this space, and its optical and electrical properties, involve the science of physics; while the constitution and composition of these bodies, their fusibility, solubility, or the reverse properties, render the science of chemistry essential.

Form, structure, and colour are some of the most striking peculiarities that are noted on examining a substance. The forms assumed by minerals bear a striking relation to their chemical composition. These forms are bounded by plane surfaces, arranged in symmetrical order, according to mathematical law, producing a definite geometrical form termed a crystal. Minerals of the same chemical composition assume, under similar conditions, the same crystalline form or forms deducible the one from the other—that is, they crystallize in the same system of crystallization, the crystals of a mineral species being essentially constant in their composition, structure, and the angles of inclination of their bounding planes. [See GONIOMETER.] The most important optical properties depend on the crystalline form. Minerals almost universally are crystalline; opal, however, is an exception. CRYSTALLOGRAPHY, or the study of these crystals, is of the utmost importance to the mineralogist. This subject has been already treated of, but it may be well to repeat that there are six systems of crystallization, varying in their degree of symmetry, to which all minerals are referred. In addition to the crystalline form, distortion, twinning [see MACLE], and the aggregation of crystals have to be noted in minerals. Of the structural peculiarities of crystals the most important is that of cleavage; this always bears a relation to the fundamental form, being parallel to one of the faces of that form in which the mineral crystallizes. When it takes place in more than one direction it differs in the facility with which it occurs. Colour, though a striking feature in minerals, is not to be relied upon, as a very minute amount of certain substances will alter the colour completely; the colour is best observed from the streak or powder of the mineral. Other properties dependent on light are lustre, refraction, polarization, and phosphorescence.

Hardness is one of the most important physical tests of a mineral, and from the facility with which it may be applied is generally one of the first resorted to. See HARDNESS OF MINERALS.

**MINERVA**, a Latin goddess. Professor Max Müller connects her name with the Latin *mens*, the Greek *menos*, and the Sanskrit *manas*, mind, thus expressing the idea of intellectual power. It is unnecessary here to relate the numerous myths of which Minerva was the central figure; but the Romans held her in high honour, and two great festivals were annually celebrated to her glorification, the Quinquatria and the Quinquatria Minor. At Rome she had three temples: one on the Capitol, the second on the Aventine, and a third on the Colian Hill. In the usual Roman fashion, Minerva, as a virgin goddess and as the daughter of Jove, was soon inextricably confused with the Greek Athēna, who shared those characteristics, though in other respects her attributes were quite distinct—Athēna having in addition to the attribute of wisdom a physical character, as the goddess of morning and of the free air and wind, springing from the brow of Zeus, god of the sky; attributes quite foreign to the original Minerva.

**MINERVA PRESS**, a London printing establishment once notorious and frequently alluded to by the eighteenth and early nineteenth century writers, but now forgotten. It flooded the town with cheap novels of the trashiest kind, full of absurd complications of plot and exaggerated sentimentalities of dialogue.

**MINES AND MINING.** The science of mining has had a gradual growth and development. Involving as it

does for its basis an acquaintance with most of the applied and natural sciences, their progressive development has rendered mining subject to continual advancement and improvement. Man at an early stage of his civilization probably found it advantageous to burrow into the earth in order to extract her treasures. On the discovery of South America the natives were found utilizing the mineral resources of their country to a considerable extent. In North America, at the Lake Superior copper mines, it is evident the Indians have worked since the decadence of the stone age, and their old weapons have been discovered (fig. 1).

Fig. 1.



Stone Hammer from the ancient copper-workings of Lake Superior. Scale, one-half.

Even in some British mines stone implements have been discovered, as in the old workings of the Magpie Mine, County Wicklow. In Eastern countries, such as Asia Minor, Servia, India, &c., there is little doubt that mining has been practised from very remote antiquity. Herodotus observes that a mountain in the island of Thasos was completely burrowed by the Phœnicians in their search for the precious metals. The silver mines of Laurium in Attica were worked by the Athenians as early as the beginning of the fourth century B.C., and under the Romans the quicksilver mines of Almaden in Spain were extensively developed.

In the British Isles it seems highly probable native metals, as gold, were worked at a very early period. The Phœnicians, according to Strabo, were in the habit of coming to the Cassiterides (probably the Scilly Isles or Cornwall) trading in tin; while of more recent evidences there are the old Roman mines in Wales, where they not only raised large quantities of gold, as at Gogofan, but had also extensive works for the baser metal lead, as at the ancient Roman lead-mine of Nantymwyn. During the Saxon period the mines were much neglected, but were afterwards chiefly worked by the Jews. In the reign of Elizabeth the art of mining had fallen into so much decay that the importation of skilful German miners was found necessary to revive it, and they received every inducement to come and settle in the country.

The term *mine*, in contradistinction to that of *quarry*, is ill-defined. In a popular sense a mine is a place where underground workings are carried on for the extraction of metalliferous material or some very useful substance, as coal or salt; while a quarry is an open working for some less valuable material, as stone or slate. But this is not precise: for often metalliferous stuff is taken out in large open workings, as in the hydraulic gold workings of California, and from such deposits as the Pary's Mountain mine in Anglesey, the Dannemora Iron Mine in Sweden, and the pyrites mines at Rio Tinto, where the method of extraction is not very dissimilar from that adopted at the Penrhyn slate quarries in Wales. Again, non-metalliferous stuff is often extracted from subterranean workings, as at the Festiniog slate quarries and the vast labyrinth of galleries which have furnished building stone from underneath the city of Paris.

In mining the method adopted in working a deposit varies with its position and form. When the deposit is irregular, or a mass deposit of somewhat similar dimen-

sions in all directions, a variety of methods are followed, according to surrounding circumstances. If, on the other hand, as is more usual, the deposit is more or less sheet-like in form, then the method of procedure is chiefly influenced by the inclination of the deposit—that is, whether its plane more nearly approaches the vertical or horizontal; the former is more usual in metalliferous mining, the latter in coal-mining. It would be impossible to enter into either of these branches in detail here; it must suffice to glance cursorily at the more interesting portions of the subject, and endeavour to explain and exemplify some of the more commonly occurring terms.

The indications of a deposit of economic value are often only to be learned after careful study of the locality and considerable practical experience; it then becomes necessary to ascertain, by several preliminary operations, its exact position, direction, and inclination. This is usually effected by *conteining*, or cutting trenches through the superficial deposits across the general direction of the lode or bed, and by sinking small pits at short intervals along the line of its outcrop. When its exact location and continuity have been proved it then becomes necessary to proceed further by underground workings. If in a hilly country this is usually performed by driving an adit level or horizontal gallery at the lowest available level, either along the deposit itself or to cut it at a short distance. This level drains all the overlying deposit, and permits of the stuff being removed without the trouble of elevating it. Where this is impracticable a shaft has to be put down. This for a highly-inclined deposit or lode, not previously explored, is continued down upon the deposit itself, and having the same inclination or underlie, is then termed an *underlay shaft*. In this, arrangements for pumping the water, winding the stuff, and ladders or a footway for the passage of the miners have to be provided. From this shaft, at intervals of 10 or 12 fathoms, horizontal levels are driven along the direction of the lode. Each two of these are subsequently joined at intervals by *winses*—short shafts opening communication between two adjoining levels. The deposit is thus divided up into rectangular blocks, which, if of sufficient value, are subsequently removed by *stoping*. This sinking of shafts, driving of levels, in fact the opening up of the mine and preparing it for the extraction of the stuff, constitutes the *tutwork*, wherein the men are paid by the quantity of work done, usually at a certain rate per lineal fathom of certain fixed dimensions. The extraction of the stuff is usually done on *tribute*, the miner getting a certain proportion out of the produce; it is sometimes, however, done on *tutwork*, at so much per ton or so much per cubic fathom.

When the worth of the mine has been proved and explorations carried on to some considerable depth, it is usual to put down a second shaft. This is generally vertical, from its convenience and the many advantages it possesses over one inclined. It is commenced in such a position on the side towards which the vein inclines that it will cut the deposit in depth, levels or cross-cuts being driven across transversely in the interval to cut the lode. In this shaft, which is generally rectangular, larger pumping machinery is provided, such as probably will suffice to combat the water for a considerable depth. In a well-regulated mine there should be at least three separate shafts, one the engine-shaft, containing the pumping machinery and arrangements for winding from the deepest part of the mine, and a footway for the use of the *shaft-men*, who have charge of the fittings of the shaft or *pit-work*, the foreman being called the *pitman* or timber man. The engine-shaft should be the largest and best constructed shaft in the mine; it is preferable that it should be a vertical or *down-right shaft*, but in many instances the lower portions are an underlay shaft going with the dip of the lode. In any case, there should be as few turns in it as possible, though in some old Cornish mines as many as fifteen or twenty



turns have been known in shafts 200 or 300 fathoms deep. Of the other two shafts, one is reserved for drawing the stuff from the main workings, the other for the ascent and descent of the miners. This may be by means of a man-engine, or as is more general, by ladders, when it is generally termed the footway shaft. In the latter instance it is seldom vertical, but is mostly on the underlay, and proceeds downwards through the old workings and abandoned winzes, so that the miners have often a great distance to travel to and fro horizontally as well as vertically.

In bed-mining, such as coal-mining, the shafts are put down vertically, and the levels proceed from the bottom of the shaft, usually in two directions at right angles to each other and joined by transverse galleries, which divide up the deposit into a series of square or rectangular blocks preparatory to removal. In the case of bed-mining the levels are generally in a plane approaching the horizontal, while in metalliferous or vein-mining they are one above the other, or in a plane approaching the vertical.

As the mine becomes opened out the rich portions are set to the tributaries for the removal of the stuff—a certain number of men (termed a *pair of men*) taking a contract, which is usually renewed each month, at a certain proportion of the produce, they having to leave the stuff at the *plat* or junction of the level and the shaft through which it is taken to the surface. The extraction of the stuff or stoping, as it is called, is now preferably done by the methods of overhand stoping, wherein the stuff is broken from above or from the back, and falling down serves for the workers to stand upon and renew the attack. They thus work gradually upwards, and by sending the stuff through a specially prepared channel—a *pass* or *mill* as it is called—to the lower level avoid the labour of haulage. In some instances, however, it is still found necessary to adopt the older plan of underhand stoping, whereby the stuff is broken from above and at the bottom of the working.

The tutwork men usually take their contract each month, at a certain rate per fathom of fixed lateral dimensions. In some cases, however, when it is desirable to hasten the work, a contract at a fixed rate per fathom for a certain distance, say 60 or 100 fathoms, is entered upon. A pair of men may consist of two, four, six, or eight individuals, who are divided up into a certain number of *cores*, according to their number, two men usually working together, and most generally working eight hours—commencing at 6 a.m. and working till 2 p.m. being called “first core by day” or “forenoon core,” the next eight hours being “second core” or “afternoon core,” the remaining hours being the “night core” or “last core by night.” When there are eight men in a pair and the work pushed on with all speed, the duration of the core is reduced to six hours, the first core going underground at 6 a.m., relief coming at 12 noon, and so on. Both tributaries and tutwork men have to provide themselves from the mine stores with materials, such as candles, tools, steel for picks, borers, &c., and the necessary materials for blasting. The price of these, with certain other charges, is deducted from their earnings and constitutes “the cost.”

Formerly the ground had to be broken altogether by the pick and gad (a small iron wedge); and where very hard a fire was lighted, and when the rock had become highly heated it was suddenly cooled by throwing water upon it. This cracked and fractured the rock, thus making it easier to remove. Gunpowder was first applied to mining in the seventeenth century, though it had been used by the Genoese at the siege of Serezanella for military mining in 1487. The use of this and other explosives has since quite revolutionized the art of breaking stuff. Holes are bored in the rock and the charge inserted, sand or broken rock—*tamping* or *stemming*—being pounded in firmly on top. Formerly a channel was preserved down the side of the

hole, in which a straw filled with fine damp powder was subsequently inserted, and the end of a candle or “snuff” placed in such a position that it would burn through the straw and ignite the contained powder, which in turn fired the charge. This method is still practised in the Laxey Mine, Isle of Man, but in mining districts generally the prickler and straw have been superseded by the safety fuze, and gunpowder is being replaced by gun-cotton or one of the nitro-glycerine compounds. In the early days of blasting the borers or jumpers were of wrought iron, tipped with steel; now they are made entirely of steel, which lasts much longer and transmits the blow better. In some cases one man turns the borer with one hand, striking with the other, using a short handled hammer. More usually one man turns while the other strikes; but the most economical method, where sufficient room can be obtained, as in a large stope, is that where there is one turner for two strikers. The hammer for these has a long handle, and weighs several pounds. Of recent years machine borers have come extensively into use, compressed air being the motive power generally employed, as steam is highly objectionable in confined workings. There are two chief types of boring machines, the one percussive, in which the action of the borer and mallet is imitated; the other rotatory, in which an annular iron ring, set with diamonds (bort), is caused to rotate and abrade the rock. The percussive type is that in most general use, and there are a vast number of forms of it. The general principle of construction has a reciprocating piston, to which the borer is attached, and which moves in a cylinder, the compressed air being admitted by properly arranged valves alternately above and below the piston. Rotation of the tool is procured by having a spiral groove cut on a prolongation of the piston, in which a stud works that is actuated by a ratchet and pawl. The advance of the tool is generally effected by a screw worked by hand, but in some machines there is a chamber of air at the hind part of the machine that cushions the blow, and on the length of stroke becoming too long more compressed air is automatically admitted, which advances the tool. The introduction of these machines has greatly modified the art of removing ground. Formerly the miner, in driving a level, took advantage of every “head” or “crack” and placed or “pitched” the holes accordingly; he seldom fired more than three or four shots at a time. Now, in order to economize time as much as possible, when the machine has been fixed in position a number of holes are bored either straight ahead or slightly inclined, and a volley fired together, which generally takes out the whole breast at one time. In driving the headings of the St. Gothard and other large tunnels the several operations were conducted in a most systematic manner, each gang of men having a special work to perform, one set boring and firing the holes, the next clearing away the stuff, &c. In this way the work was greatly accelerated.

The tendency there has been of late years to use explosives of high power in breaking rock has lessened heavy manual labour to a considerable extent. The holes for these explosives are of much smaller diameter, thus necessitating much less labour; they can also be driven deeper so as to shatter more rock.

Gunpowder seems to have been discovered in this country by Roger Bacon in the middle of the thirteenth century, but it is supposed to have been known in both China and India some thousand years previously. It is a mechanical mixture of three-fourths nitre, three-twentieths charcoal, and one-tenth sulphur; but the proportions of the ingredients vary greatly. In blasting powder the proportion of sulphur is greatly increased. It ignites at about 600° Fahr., and after combustion or explosion the products are, carbonic dioxide (CO<sub>2</sub>), sulphide of potash, nitrogen, and a small amount of sulphurous acid. The gaseous products, nitrogen and carbonic oxide, occupy about 800



times the bulk of the powder previous to explosion at normal temperature; but at the temperature of explosion the bulk is probably increased to over 1500 times that of the original by the expansion of the gases. *Gun-cotton*, which was discovered in 1845 by Schonbein, a Swiss chemist, is a chemical compound formed by treating ordinary cotton with a mixture of one part nitric acid and three parts sulphuric acid; the cotton becomes nitrated, peroxide of nitrogen replacing a portion of the hydrogen in the fibre. Under proper conditions dissociation occurs, the excess of oxygen serving for the combustion of the hydrogen, and the carbon of the fibre forming carbonic acid, water, and nitrogen. For blasting purposes it is usually pulped and pressed into cylinders or cakes of convenient size; it ignites at about 300° Fahr. and burns brilliantly without explosion. It may be exploded by a detonating fuze or by a sharp blow in many cases. It exerts a mechanical force about six times that of gunpowder. The most common forms are tonite and potentite. *Nitro-glycerine* is a chemical compound very similar in composition to gun-cotton. It was discovered by an Italian, Sobrero, in 1847, and is produced by the action of a mixture of strong nitric and sulphuric acids on glycerine, the change taking place being analogous to that effected in the manufacture of gun-cotton. It is a yellowish oily liquid, heavier than water, in which it is insoluble. It freezes at 43° Fahr., and is then very liable to explosion by percussion. Unless when quite pure it is liable to undergo spontaneous decomposition, and is easily exploded by mechanical violence. It exerts a mechanical force on explosion from five to ten times that of an equal quantity of gunpowder. For blasting purposes a sufficient amount is poured into the hole, which is filled up with water, and the charge fired by a fuze to which a detonating cap is attached. The difficulties of transport and storage, and its liability to accidental explosion, limit its application in the crude state for mining purposes; but in a modified form it is extensively used, and is the blasting agent superseding almost all others in many mining districts. The most familiar of these modifications is *dynamite*; this is a silicious earth—*kieselguhr*—composed of the cellular sheaths of diatoms saturated with nitro-glycerine. This is a reddish-brown or brownish-yellow solid, somewhat plastic, containing up to 75 per cent. of nitro-glycerine. When ignited it burns like nitro-glycerine without explosion, producing irritating red fumes of nitrous oxide. It can be readily exploded by a detonating cap, and exerts a mechanical force five or six times that of gunpowder, but which is dependent on the amount of nitro-glycerine absorbed. The products of the explosion when the air is excluded are—nitrogen, carbonic dioxide, and water. Dynamite does not explode readily under concussion, the elasticity of the absorbent evidently exerting a protective influence. When frozen, however, it is more dangerous. Another very useful preparation is that known as *blasting-gelatine*. This is an intimate incorporation of 7 or 10 per cent. soluble or colloid gun-cotton with 90 or 93 per cent. nitro-glycerine, apparently forming a definite compound; to this is added about 10 per cent. of more highly nitrated gun-cotton in a finely divided state, forming a substance stable under ordinary conditions, but which may be exploded by a detonating cap. When ignited in an unconfined space it burns without explosion. It is a light olive-brown gelatinous substance, that is not injuriously affected by immersion in water. Its explosive force is considerably greater than that of dynamite, but its action has more the nature of a rending force like gunpowder, than of a shattering one as with dynamite; and in order to obtain its most effective results, it should be retained in a strongly confined space. Dynamite and blasting-gelatine are the explosives most in favour among miners generally; and although new explosives are constantly being introduced, it is very improbable till some

more sterling advantages are secured, that these nitro-glycerine preparations will be superseded. The cartridges commonly used for ordinary blasting purposes are about 4 inches long, and in the case of dynamite 1 inch in diameter—blasting-gelatine of  $\frac{3}{4}$ -inch in diameter being the more usual size. Two of these cartridges are generally amply sufficient for a hole 18 inches or 2 feet long in hard compact rock, but the charge varies greatly according to the load upon the hole; however the tendency is to over-charge, as it not only tears out its load but shakes the surrounding rock, so that it may be removed with the pick and gad. The operation of charging and firing a hole is somewhat as follows:—The hole having been bored to a sufficient depth is cleaned out; a piece of safety fuze of such a length that it will project a couple of inches out of the hole is then cut off, and on the clean cut end is placed a detonating cap, which is squeezed so as to adhere firmly to the fuze, and so that the contained charge of fulminate may be somewhat loosened; the cap is then pushed into a primer or small cartridge, the inclosing paper of which is tied firmly to the fuze above the cap, so as to inclose the whole in a sort of bag. The requisite number of cartridges are then taken, one and a half, two, or more as the case may be, and put into the hole separately, and rammed close with a wooden rod, so as to fill the bottom of the hole; the fuze with the primer attached is then let down, and the tamping or “stemming” filled in. This latter may be water, in which case care should be taken that the junction of the fuze and detonator is rendered water-tight by grease, tar, or some similar substance; loose sand or pulverized rock is commonly used for stemming; with blasting-gelatine it is well to press the stemming down firmly. In order to fire the hole a “snuff” or candle end is lighted and placed under the projecting end of the fuze in such a position that it burns through the coating of the fuze and ignites the core of powder, which in turn fires the detonator and explodes the charge. Usually two or more holes are fired at once, and at such a time that an interval may be allowed for the smoke to clear before the men resume work. In case the hole miss fire, after waiting twenty minutes or half an hour for safety, it is usual to take out a couple of inches of the stemming and put in a fresh primer with detonator and fuze attached; this is covered up with clay, and on being ignited the concussion seldom fails to set off the charge.

Reviewing briefly the several explosives in use, it may be stated that *gunpowder* is highly valuable for simple rending where a shattering is not desirable; it is troublesome to use in wet places, and the smoke and fumes produced by it are very dense and offensive. *Gun-cotton* is a far more powerful explosive; it produces little smoke, and the fumes are the least objectionable. The form in which it is generally supplied is solid, hard, and compact, so that it cannot be squeezed out in order to fill the bottom of the hole; should the diameter of the hole in any place be smaller than that of the cartridge, a more serious objection arises. *Nitro-glycerine* in the liquid form has some advantages for holes projecting downwards, but for those heading upwards it is obviously inapplicable unless inclosed; should there be cracks or holes in the ground, some of the liquid is liable to escape, which may lead to serious accident subsequently. The chief objection, however, to nitro-glycerine in this form is its liability to spontaneous decomposition when impure, and to explode on concussion. *Dynamite* has many advantages; it is a most powerful shattering explosive requiring little tamping, and owing to its plasticity it may be pressed out so as to completely fill the bottom of the hole, or moulded in the hand to fit a small hole. It is safe to handle—less dangerous even than gunpowder—and the fumes produced by its explosion are not nearly so dense or objectionable as those from gunpowder; with many people, especially those who are not used to them,

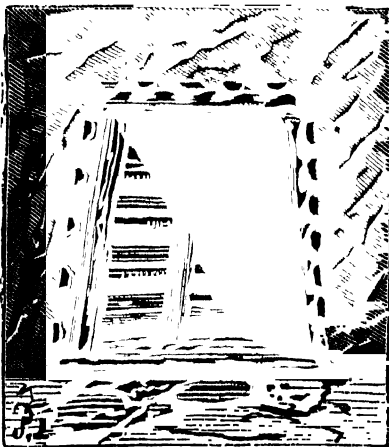
they, however, produce headache and a feeling of sickness. *Blasting-gelatine* has all the advantages of dynamite as to plasticity, &c., but it has a rending action more like gunpowder; bulk for bulk it is far stronger than dynamite, and does not produce so dense smoke nor so objectionable fumes, and as nitro-glycerine has an excess of oxygen, while soluble gun-cotton has a deficiency, an incorporation of the two should produce a compound with a theoretically higher explosive energy. It is probably one of the safest and most advantageous explosives at present known. Of the numerous other explosives that are manufactured or have been proposed for mining purposes may be mentioned—*duolin*, a mixture of nitro-glycerine and nitrated cellulose allied to gun-cotton, but made from sawdust; *chlorate of potash powder*, or safety explosive compound, is composed of one part sulphur to two parts chlorate of potash, the ingredients being kept separate till required for use; *rack-a-rock* is a somewhat analogous compound of American manufacture. *Picric acid* and several picrates are very strong explosives, but highly dangerous. Under certain conditions, especially in fiery coal mines, where a light is objectionable, it has been proposed, and practised with considerable success, to substitute *quicklime*, or some substance that swells on wetting, for explosives, in wedging down masses of rock. For this purpose cartridges of quicklime are prepared, and after tamping them firmly in the hole, water is run in through a channel left for the purpose.

The opening out of a deposit is effected by levels, cross-cuts, shafts, winzes, and rises. A *level*, *gallery*, *drift*, or *heading* is a tunnel excavated through the rock as nearly horizontally as possible. Formerly these levels were made very small, in some cases barely sufficiently large for a man to move along, or at most a man with a wheel-barrow. Of late years, except in the case of short trial levels, they are made of sufficient dimensions to permit of tram waggons, and even horses in some cases, passing to and fro with ease. For ordinary purposes a height of 7 feet and width of 5 are sufficient, but the main levels of a mine are often constructed larger; provision has to be made for carrying off the water by a channel at the bottom, over which the supports for the tram rails are laid. In many instances an

rounding part is taken away, or in certain rocks that disintegrate on exposure to the air and moisture, supports have to be provided in order to keep it open. Adits and main levels that are likely to be required for a considerable time are sometimes encased in brick or stonework, but more usually wood is employed. Fig. 2 will give some idea of the "timbering" of a level; the vertical framework being known as a "set of timber," consisting of two "legs," a "cap," and a "spreader," the horizontal pieces inside these being known as the "side laths" and "back laths," i.e. those at the top. In driving through very bad or "running ground" special methods or "spilling" are adopted. A *cross cut* is a level driven transversely to the general direction of the lode, either for the purpose of exploring the adjacent country, or to connect two parallel levels or lodes, or to join the workings on a particular part of an inclined lode with a downright shaft. Except as regards their relation to the direction of the lode they are similar in almost every respect to ordinary levels. Along the main levels are now usually laid edge rails, which were introduced about 1820, and the stuff drawn along in tram waggons; this is usually done by men or boys, but in some instances ponies or donkeys are used, and in some collieries the waggons are hauled by a rope attached to a stationary engine. Formerly most of the stuff was transported to the shaft in wheelbarrows, but it was not uncommon to have the adit of large dimensions, with several feet of water on the bottom, so as to be able to convey the stuff along in boats. Such a level was called a *boat level*. *Winzes* are small shafts connecting different sets one above the other; they are often inclined. They do not differ much from ordinary shafts, except that they are shorter, and as a rule smaller; they seldom open to the surface, or have any fittings except a footway or set of ladders. A *rise* is a winze or shaft worked from below upwards, usually in an inclined direction. When putting down a winze, a rise is generally put up at the same time from the level below to meet it; the same practice is often followed in sinking new shafts in a mine, so that they may be worked from several points at once. Even to practised hands, striking a hole upwards is laborious; nevertheless the advantages there are in putting up a rise over sinking a winze, in that the stuff falls away downwards, &c., more than compensate for this.

Shafts for metalliferous mines are generally made rectangular; they vary greatly in size according to the purpose for which they are required, the size of "pitwork" or pumping appliances, and the method of winding the stuff that is to be adopted. For modern work a shaft 16 feet long by 9 wide is not too large. When sinking through bad ground or water-bearing strata, various devices have to be adopted. In coal-mines the shafts are generally circular, and vary in diameter from 12 to 20 feet; some are walled up with brick. Formerly timber tubbing, to dam back the water in passing through aqueous strata, was much used, but this is now largely replaced by metal tubbing. This may be put in in cast-iron plates bolted together, or in cast-iron rings. Metal tubbing usually receives a protective lining of brick. In passing through water-bearing strata it is sometimes preferable to put down the shaft before pumping out the water. This may be done by Trigers' method of a pneumatic cylinder. The most approved method, however, is that of Kind-Chaudron, which consists of boring out the shaft full size with a large boring tool; then the tubbing is let down, with a specially arranged water-tight joint at the base; the water is then extracted, the bottom of the tubbing pinned up, and the sinking proceeded with in the usual way. In sinking the pioneer shaft of a metalliferous mine provision has to be made for pumping out the water; for this purpose the lower "lift" or column of pumps is suspended by chains, and lowered as the sinking progresses. The sinking of

Fig. 2.



Sectional view of Timbered Level.

air-pipe, for conveying the compressed air to the boring machines, and for assisting in the ventilation of an advanced heading, is also inserted. When driven through solid rock the level usually needs no support; but when passing through soft or bad ground or in the lode, where the sur-

the engine shaft, and the "forking" or pumping out of a flooded mine, are operations requiring much practical experience and considerable skill. Previous to the introduction of the steam engine the influx of water and the difficulties of drainage limited, in a very short time, the depth to which it was practicable to sink shafts. In old times the water had to be raised by buckets, hand-pumps, and similar devices. In parts of Japan hand-pumps are still used having wooden barrels, the water being raised by a series of short lifts. In some of the deeper mines of Cornwall, previous to the introduction of the steam engine, horses were attached to a whim which worked the pumps; this proved a most harassing expedient. Early in the last century Savery proposed a method of raising water into a vacuum produced by the condensation of steam. This method does not appear to have attained much practical success. Shortly afterwards Newcomen devised his engine, which soon developed into the Savery-Newcomen type of atmospheric engine, and was perfected in the hands of Smeaton. It was largely employed for pumping water from mines. In 1765 Watt's discovery of a separate condenser, and the various adjuncts he introduced, caused the atmospheric engine to be completely superseded by the Watt steam engine, from which was very soon evolved the Cornish pumping engine, one of the most economic engines known for the pumping of water. This engine has rendered depths accessible that were previously considered impracticable: Dolcoath, the deepest mine in Cornwall, being down 420 fathoms, or very nearly half a mile. The Cornish pumping engine is a single-acting engine; steam being admitted above the piston depresses it and brings down the inner end of the beam—this is called the "indoor stroke;" on opening communication between the upper and lower sides of the piston equilibrium is established, and the weight of the pump rods, &c., lowers the outer end of the beam, thus making the "outdoor stroke." In the early days of the pumping engine all the lifts were drawing lifts—like those of an ordinary suction pump; but on the invention of the plunger lift it was adopted for mining, and is now applied in almost all mines (except for the lower two lifts, where the drawing lift is preferable), forcing the water to the surface by a succession of lifts, generally from 40 to 50 fathoms high. The pump rods are made of sufficient weight to more than counterbalance the column of water; the excess of weight is taken off by *balance bobs*, water columns, or other counterpoise. During the indoor stroke the engine has to raise the weight of the rods plus the weight of water in the drawing lifts, and has to fill the plunger barrels; during the outdoor stroke the weight of the rods forces the contents of each plunger barrel up the height of its lift. Of other engines used for pumping, the Bull engine has the cylinder placed directly over the shaft, and the pump rods attached direct to the piston, so that the rods are raised by the steam without the intervention of a beam. This plan obviates the necessity of a substantial engine-house; but there are serious objections to the blocking up of the mouth of the shaft. Horizontal engines are applied to pumping; they need, however, the intervention of angle bobs, with pins, &c., which increase complications. In many collieries where there is a wide lateral space in which the water may accumulate, in case of mishap to the engine a direct-acting engine is placed underground, that forces the column of water direct up to the surface without needing the addition of pump rods. In metalliferous mines, where at the bottom there is small accumulating space, and where the water rises so rapidly that in case of an accident the engine might be submerged before it could be repaired, such a plan, though having many advantages, is hardly applicable.

The pumps in a mine are now almost always made of iron, and they vary in diameter up to about 20 inches, but for very deep mines they are seldom put in larger than about 10 or 14 inches diameter. The bottom lift is always

a drawing lift, so that it can be operated from above in case of the water rising. At the bottom there is a perforated nozzle for taking in the water—the *snore piece*: when the engine is keeping the water at its proper level this takes in air towards the end of each stroke, hence the name, and the engine is said to be working *in fork*. Some feet above the snore piece there is a valve, the *lower clack*, that is accessible through a hole in the side closed by an iron door; this is the *door piece*. Above this comes the *working barrel*, in which the *pump bucket* works. The bucket consists of an iron framework edged round with a ring of strong leather; the valve also is of leather. When



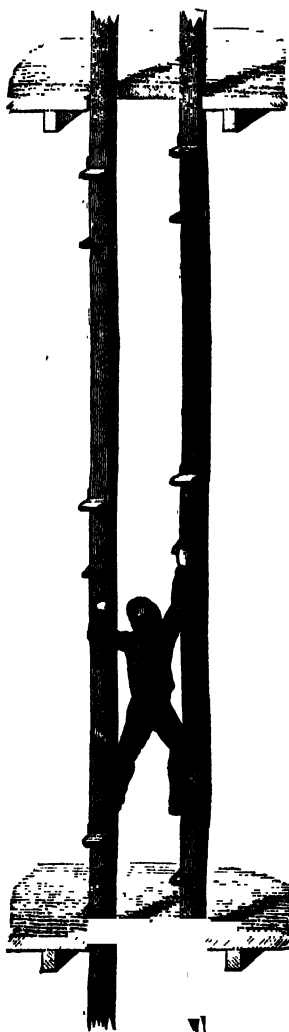
Fontaine's Safety-cage (parachute). Scale, one-fiftieth.

the leather wears out the bucket has to be changed, *gearing the buckets*, or fitting them with leather, being the pitman's special duty. The bucket is attached generally to an iron rod, that is joined on to the *main pump rod*; it draws out usually at the top of the lift. The plunger works like an ordinary force-pump; there is a snore piece, but it should always be submerged, as air in the barrel impairs the working of the plunger. The H-piece is a large casting so called from its form, which makes communication be-

tween the plunger barrel and the column of pumps. At the base of the column there are two valves, one above the other—the *lower* and *upper clacks*—and separated by the passage to the plunger pole; during the upward or indoor stroke the lower clack opens, admitting water below the plunger; during the outdoor stroke this closes, and the upper clack is opened by the water being forced up the column to the next lift.

The pump rods are made of square timber, varying in size according to the depth of shaft and size of pumps; they are provided with guides, and *catch pieces* or projections that rest on special supports in case of breakage or stoppage; in inclined shafts they rest on rollers, and at an angle or change of inclination in the shaft *angle bobs* or *fend-off pieces* are put in. In deep shafts, in order to take off the excess of weight, balance bobs are also adopted.

Fig. 4.



The Man-engine, with double movable ladder.

falling down the shaft in case of a breakage. When the rope breaks the spring comes into action, and thrusts the catches outward so as to become embedded in the runners or guide rods, and so keep the whole suspended in the shaft, as shown. Wire ropes are now generally employed for winding purposes; they have many advantages over the old iron chains.

The winding may be performed by a horizontal engine or by a Cornish double-action rotary engine. Formerly the horse whim or gin was much used, but except for small or temporary shafts this is not now much employed. It consists of a horizontal drum round which the chains or ropes are wound; two projecting arms serve for yoking the horses that work the machine. In some cases the hand windlass or tackle is still employed.

The facilities for the ascent and descent of the miners are of the utmost importance. A good ladder, road, or foot-way should always be provided; but in deep mines after a heavy core's work this is a most laborious method of egress. In mines where cages are employed the miners are generally raised by winding. In many mines the *man-engine* or *Fahrkunst* is used. Fig. 4 represents a double man-engine. This consists of two parallel reciprocating rods, to which small platforms are attached, and which are actuated by a proper engine. Suppose a man to be ascending he stands on one platform while that rod is moving upwards; when it comes to the end of its stroke he steps to the platform on the other rod, and so on. When going down the reverse is the case, the man always getting on to the platform of the descending rod. With a single-rod man-engine the man rests on a fixed platform while the rod is making the stroke the reverse of the direction in which he wishes to proceed. The double-rod man-engine was used in the Hartz mines in 1834. In this country the first was erected at Tresavean, Cornwall, in 1843. A single-rod engine was erected at Fowey in the same county in 1851. This form is now used in most of the deep mines of the country.

The importance of proper ventilation in mines has been fully recognized in recent years. In metalliferous mines the engine shaft, being the deepest, is usually the upcast shaft; the air proceeds down the other shafts, and after being conveyed through the stopes and pitches, enters this shaft through the lowest level. Various supplementary means have often to be adopted for ventilating remote ends and headings. The use of compressed air for driving the boring machines has greatly improved the condition of many of these places; by turning the end of the air-pipe into a pipe of larger diameter a very effective ventilator may be constructed on the same principle as the steam blast. The water trompe or blast propelled by a column of falling water is a favourite method of forcing air to a working place, and the air so obtained is often much preferred by the miner; it is cool and no doubt has much of the smoke and noxious vapours washed out of it. The fan machine is another favourite device, also the method of pipes leading from a door or other stoppage in the natural current of circulation. In coal-mines the matter of ventilation has to be far better attended to, on account of the risk of explosion, and artificial means are often resorted to in order to promote it; these may consist of a furnace in the upcast shaft, or the application of an exhaust fan, such as that of Guibal: the air as it descends is split up into a number of separate currents that are conveyed to the different workings, and eventually to the outlet or upcast shaft.

The lighting of mines in this country is usually effected by candles, a piece of moist clay serving to prevent it from wasting and as a candlestick for attaching it to the hat or in other places. The manipulation of this clay is a crucial test of a true miner. In some districts small lamps burning oil or solid paraffin are used. In coal-mines, owing to the explosive nature of the gases that often emanate from the beds, a special form of lamp has often to be used; this is the safety-lamp, first invented by Davy, who discovered that by inclosing the light in fine wire gauze the temperature became reduced to such an extent that the flame could not pass through the gauze under ordinary conditions and ignite the surrounding atmosphere. In its

original form the gauze cut off a large amount of light, but several improvements have been effected upon it since. Some of these are represented in figs. 5, 6, 7. Previous to the introduction of these lamps an iron wheel working against flints was the light used in fiery places, and in some mines it was the practice to ignite the fire-damp at stated hours when the men were absent.

For the systematic working of a mine it is most important that proper surveys of it be made. This is generally done by using an application of the compass, the *miner's dial* or a mining theodolite, the operation being

termed *dialling*. It is done on a system of traverse-surveying, the inclination and declination having also to be taken into account.

After the ores have been brought to the surface they have generally to go through a series of operations termed dressing, the object of which is to get rid of the worthless portions and concentrate the richer. For this purpose the ore is usually subjected to a process of hand-picking or sorting, after which it may be broken up by a stone-breaker, and then crushed between a set of crusher-rolls, or pounded up fine by stamps. It may be then washed, for

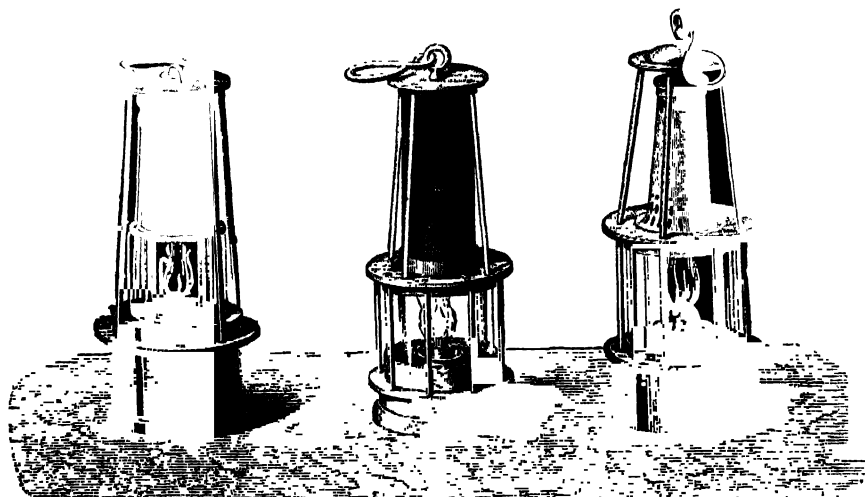


Fig. 5. Mueseler's Lamp, with gauze and glass cylinder. Fig. 6. Dubrulle's Lamp, with chimney. Fig. 7. Petroleum Lamp.

which there are a variety of machines, such as jigs, buddles, frames, besides numerous others. In some cases it may be necessary to calcine the ore, and after further pulverizing it to put it through such processes as tossing, packing, &c. There are besides, in the treatment of gold and silver ores, the various operations of amalgamation, which belong more properly to the subject of METALLURGY. These and a precise description of the dressing of ores cannot be entered upon here.

Of late years the condition of the miners has been greatly improved by the introduction of the Metalliferous Mines Act (1872), and the Factory and Workshops Act, under which the dressing floors and surface operations come; but several anomalies still exist owing to the want of harmony of the two Acts. Thus although boys under fourteen cannot be employed on the floors they can work underground at twelve.

Mines belong to the tenant in fee-simple of the land, with the exception of gold and silver mines, which belong to the king by his prerogative; but by 1 Will. & Mary, c. 30, a mine of lead, copper, or tin is not to be considered a royal mine though silver be extracted from the ore. The owner of land in fee-simple is the owner of everything which lies in a perpendicular direction under the surface to any depth. A tenant for life, unless his estate is without impeachment of waste, cannot dig earth, lime, clay, or stone, except for the repair of buildings or the manuring of the land. He cannot open a new mine, but he may work mines which are already open, and he may open new shafts for working veins of coal which have been already worked. A tenant in tail can cut down timber or open mines.

The freehold of all copyhold lands is vested in the lord, and consequently the mines. In some cases a copyholder of inheritance has by the custom of the manor a right to the timber, and the lord has no right to dig mines, unless there be a custom which gives him the right. It is not

uncommon for one person to be owner of the surface of the land and another of the mines beneath; and several persons may be owners of different kinds of mines lying above each other in the different strata.

The formation of coal and its geological occurrence, together with an account of the coal-fields of Great Britain, have been treated of in the article COAL. Maps I., II., III., and IV. now given will show the distribution of coal-bearing strata in England, and the geological structure in connection with each of the most important British coal-fields. As regards the methods of working coal-mines there are many particulars in which they differ from those adopted in metalliferous mining; some of these may be briefly referred to here. The thickness of workable beds of coal generally varies from 3 or 4 to 8 or 9 feet; although sometimes, when several seams come together, they expand to 20 or 30 feet, of which we have an example in the "ten-yard coal" of Staffordshire. In every coal-field there are many seams at greater or less intervals, one below another, of which as many as three or four are frequently worked in the same mine.

When the position of the beds of coal has been discovered, the first process is to sink a perpendicular shaft from the surface so as to intersect the various strata containing the coal, and of course as many of the beds of coal as are considered to be worth working. The upper portion, as far down as the solid rock, is either bricked or walled, and where the ground is weak this casing may be continued throughout. On reaching the coal, drifts are set off on each side, and the excavating of the coal is commenced. There are two modes of conducting the operations, namely, by what is called the "pillar and stall" and the "long-wall" methods. By the first of these, pillars of coal are left to support the superincumbent strata, so that roads may be carried into their faces. These pillars are removed when there is no longer any necessity

for supporting the roof. By the second the whole of the coal is removed in one operation, and the roof allowed to subside and rest upon the debris of the seam. Roads are carried through the "gob," the roof being blasted down to afford sufficient height for the horses to pass through. In either way roads laid with rails are carried into the coal faces, and upon these the tubs run in which the coal is conveyed to the shaft. Thus the operations continue, until the mine resembles a town of streets rectangularly arranged. The water encountered in the above operations is drawn to the surface by a steam-engine erected at the top of the shaft, similar to those used in Cornish mines; but where there is little water it is so arranged as also to raise the coal and rubbish, for which purpose either "corves" or baskets are commonly employed. In small coal-mines the ventilation is managed by separating a portion of the shaft from the larger part by an air-tight boarding, which is carried down to the bottom; but in large coal-mines another shaft is sunk at some distance from the first, and when the communication between them has been effected, the one is made downcast and the other upcast, the air being made to pass through the whole of the passages.

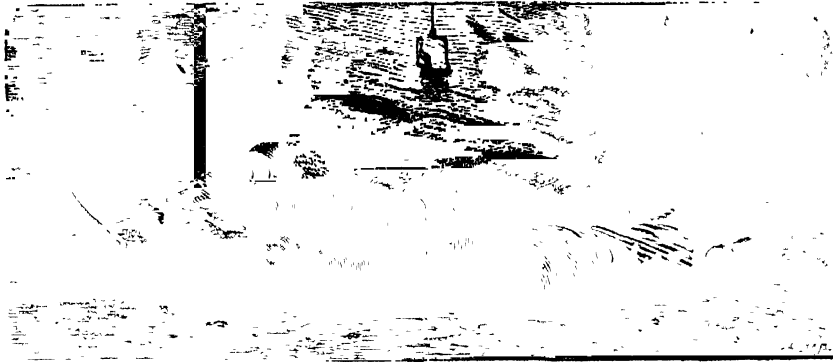
While the workings on the first seam of coal are thus going on, the shaft may be sunk to a second or third seam,

where similar operations will be commenced; small underground pits or "staples" being sunk at intervals from the workings on the upper seam to those on the seam below, by which ventilation will be promoted.

The mode in which the pitman proceeds in excavating the coal is by cutting a narrow fissure in the seam on each side of the bord with his pickaxe, and undermining the coal between (see fig. 8), and then cutting into and forcing down the isolated portion of coal; or, where the seam is thick, by detaching the great cubical mass thus prepared by blasting, two or three shots being sometimes simultaneously fired at the top of the seam. From 60 to 80 or even 100 tons of coal may thus be brought down at once, when it is put into corves, drawn along a tram-road to the shaft, and thence raised by a steam-engine to the surface, where it is often passed over gratings or "screens" in order to separate the small pulverized coal from the larger masses.

Of the various minerals for the extraction of which mines have been opened in Great Britain, it may be stated that *gold* has been worked in several places in Wales, both in placers or alluvial deposits and in veins. It has also been worked at Leadhills, Scotland, and at Croghan Kinshellagh, County Wicklow, Ireland. Although the deposits

Fig. 8.



Holling Coal

in some instances were rich they have seldom proved extensive, and were therefore soon exhausted, being incapable of supporting the large companies promoted for working them. *Silver* has been worked in several places in Cornwall and Ireland, but the chief source of this metal in the British Isles is the argentiferous galena found in some of the rocks. *Lead* has been extensively worked in the British Isles since the time of the Roman occupation. Galena is the mineral chiefly raised. It occurs extensively in the slaty rocks or "killas" of Cornwall, where it is often highly argentiferous, and also in somewhat similar rocks in Wales and the Isle of Man. In granite it occurs in parts of Ireland, where it has sometimes been found accompanied by native silver or rich silver ores. In the carboniferous limestone it occurs in Yorkshire, Derbyshire, Flint, Denbigh, and some other places, besides in similar rocks in parts of Ireland. *Copper* was at one time a leading product of the British Isles, the mining district of Cornwall and Devon being the principal centre; many of these mines have now passed into tin mines in depth, while others have been worked to such a depth that the raising of ore has ceased to be profitable. Of other ancient copper mines may be mentioned the Pary's and Mona mines in Anglesey, discovered in 1768, the Berclaven mines in Cork, the Knockmahon and Bonmahon mines in Waterford, besides the extensive mineral deposits at Ovoca, largely

worked for sulphur ore, but which also contained fine bunches of copper.

*Tin* mining is exclusively confined to the counties of Cornwall and Devon, where it occurs chiefly in a peculiar granite or in the killas adjoining this rock. Operations for its extraction have been carried on from remote antiquity, and it promises to continue for some time to come a source of revenue to that district. The supplies of tin ore from Queensland, New South Wales, and the East Indian Islands have reduced the price to such an extent that many good mines have had to be abandoned. *Zinc* is raised chiefly as a secondary product from mines raising lead or copper ores; blende or sulphide of zinc being the chief source of it. *Manganese* is now little worked in this country, though formerly raised in the Cornish district and in North Wales. *Antimony* has been worked in East Cornwall about Endillion, but the association of lead with it has proved detrimental to its economic reduction.

*Iron* has been raised in enormous quantities in the British Isles; the chief ores are those found in the coal measures associated with the seams of coal. Other important sources of supply are the ores from the Lias and Oolites of Northamptonshire and other places. The hematite and chalybite deposits have provided rich ores and in tolerable abundance. Important deposits of these occur at Cleator Moor and at Ulverstone. Veins of hematite and chalybite have been

worked in Cornwall, but the supply of foreign ore has driven them out of the market. The iron ore measures in the tertiary basalts of Antrim at one time promised to prove an important source of supply, but of late years their production appears to have declined.

**COAL MINES REGULATION ACT.**—This important Act was passed in 1887, and came into operation on 1st January, 1888. It consolidates, with amendments, the Coal Mines Acts, 1872 and 1886, and the Stratified Ironstone Mines (Gunpowder) Act, 1881, and applies to mines of coal, stratified iron-stone, shale, and fire-clay. Its chief provisions are those which prohibit the employment below ground of boys under twelve and of girls and women of any age, and regulate the hours of employment of boys over twelve below ground, the number of hours being limited to fifty-four hours in any one week, and to not more than ten hours in any one day. Employment of boys, girls, and women between the hours of nine at night and five on the following morning, on Sundays, and after two o'clock on Saturday afternoon is prohibited. The sections of this Act relating to wages prohibit their payment at public-houses, &c., provide for the payment of persons employed in mines by weight, and for the appointment on the part of the men, at their own cost, of "a check-weigher," to whom every facility is to be afforded for carrying out his duties, always providing that the working of the mine be not interrupted or impeded thereby. Single shafts are prohibited in every mine actually worked; and not less than two shafts or outlets, with which every seam for the time being at work in the mine must have communication, must be provided. Special rules have to be observed at every mine with the object of lessening the risks to which the people employed therein are exposed, and the Act also provides for the periodical inspection of the mine on behalf of the workmen by any two of their number, or any two persons who are practical working miners, at their own cost. Sec. 60 is too important to be omitted, it runs as follows:—"Where person who owner, agent, manager or underground of, or a person employed in or about a mine, is guilty of any offence against this Act which, in the opinion of the court that tries the case, is one which was reasonably calculated to cause serious personal injury to any of such persons, or to cause a dangerous accident, and was committed wilfully by the personal act, personal default, or personal negligence of the person accused, such person shall be liable, if the court is of opinion that a fine will not meet the circumstances of the case, to imprisonment, with or without hard labour, for a period not exceeding three months."

**MINIM**, in music, a character or note formed of a round open head, and a stem descending on the left or ascending on the right, as here shown. It is half as long in duration as the semibreve, and double as long as the crotchet. When first introduced, the minim was the shortest note in music, as its name indicates. The *minim measure* of apothecaries is the sixtieth part of a fluid drachm.

**MINING, MILITARY.** See FORTIFICATION.

**MINISTERS OF STATE**, the public functionaries who conduct the business of the several departments of state. Those forming the executive government have been fully described under **CABINET**. The ambassadors and representatives of foreign states are also called ministers, and are divided by diplomatic usage into three orders, the first including papal legates and nuncios, and ambassadors ordinary and extraordinary. [See **AMBASSADOR**.] The second class includes envoys, ministers plenipotentiary, and papal internuncios. The third class comprehends ministers resident, ministers chargés-d'affaires, diplomatic consuls, and deputies or commissioners sent to international congresses. [See **CONSUL**.] A minister of the first class is entitled to both public and private audiences of the sovereign to whom he is accredited; a minister of the second

class to private audiences only. Those of the third class usually conduct their negotiations with the minister or secretary of state for foreign affairs. All representatives of foreign states are the natural protectors of the subjects of their own state in the country to which they are sent.

**MINIUM** or **RED OXIDE OF LEAD** occurs associated with galena and other lead minerals, but not in sufficient quantity to be regarded as a source of lead. This mineral is found usually pulverulent. It is of a bright red colour, and is composed of the protoxide and binoxide of lead. Minium has the same composition as the red lead of commerce; and this article, which is used as a paint and in the manufacture of flint glass, is prepared artificially from pig-lead by heating it in a furnace till it becomes oxidized and converted into litharge. This substance is then placed on iron trays and heated in a current of air, which produces a higher state of oxidation, and red lead is formed.

**MINK** is the name given to some small weasel-like carnivorous mammals belonging to the genus *Putorius*, and family *MUSTELIDÆ*, and forming the subgenus *Lutreola*. The mink approaches the marten more nearly than the weasel, in the form of its body, which is stout and from 15 to 18 inches long, not including the tail, which is about 8 inches in length and bushy. The toes are partially webbed, and the intervals between the large naked pads of the soles of the feet are not provided with hairs. Two species of mink are well known, so closely agreeing in size, form, colour, and habits, that but for their wide separation in distribution they would probably be regarded as one species. The European Mink (*Putorius lutreola*) is found chiefly in Russia, though formerly it extended into Germany. The colour varies from light yellowish-brown to dark brown, the tail being generally black; the edges of the upper lip are white. The under fur is soft and downy, with large coarse hairs intermingled. The fur is very valuable, and is often sold as sable. The American Mink (*Putorius vison*) is distinguished by its slightly larger size, more bushy tail, and dark upper lip. It is widely distributed throughout North America. The scent glands in this, as in the preceding species, are well developed; so that the mink yields only to the skunk in offensiveness. The fur is an important article of commerce, though less valuable than that of the European species.

The mink is thoroughly amphibious in its habits, living near the banks of ponds and streams. It is an excellent swimmer and diver, and, like its congener the otter, runs well on land. It feeds on frogs, fishes, molluscs, crustaceans, small birds, and small mammals, such as rats, mice, and rabbits, and also makes extensive depredations on the poultry-yard. It makes its nest in burrows in the river-banks and breeds in early spring, producing five or six young at a birth. Though exhibiting all the courage and ferocity of its allies, the mink, when taken young, is easily tamed, and is very generally kept by farmers in North America as a rat-ter, and also bred for the sake of its fur.

**MINNEAPOLIS**, a city of the United States, in Minnesota, finely situated on the right bank of the Mississippi, at the falls of and opposite St. Anthony, which is incorporated with it. It is 8 miles west of St. Paul and 3 miles from the Minnehaha Falls. The headquarters of the flour manufacturing interests of the United States, and now a city of 100,000 inhabitants, it was, little more than thirty years ago, a mere hamlet, originating in a small grist mill for the convenience of a few soldiers. The first lumber mill was not built until 1848, and the village of St. Anthony Falls was surveyed in 1849. In 1854 there was built a flour mill, and the first suspension bridge was thrown across the Mississippi.

Owing to the vast store of water power obtainable from the falls, the rapid progress of Minneapolis has every appearance of permanency and continuance. The



lumber manufacture, engine and agricultural implement making, iron working and carpentering industries, are all carried on on a great scale. The town is well built, and has all the usual religious, educational, and social institutions of a great city. Trunkways pass along the symmetrically laid-out, wide, level streets, and three rival railways have their common depot centrally situated. The gradual recession of the falls from the wearing away of the soft sandstone which forms a portion of the river bed has been arrested by a subterranean concrete wall constructed across the river behind the falls and carried 50 feet into each bank, and by covering the falls themselves with heavy crib-work filled with stones, and flooring the whole over with timber. A short way above the falls the water is turned into a canal 60 feet wide and 14 feet deep, carried parallel with the river, and furnishing water for about twenty flour mills and several saw mills.

**MINNESINGERS** (Ger. *minne*, love), the troubadours of Germany, who flourished in the twelfth and thirteenth centuries. Their lyrics are by many esteemed more highly than those of their rivals and contemporaries, the troubadours of Provence, and they undoubtedly form the first era of German poetry. Most minnesongs are in the Swabian dialect, probably because the great period of the art was under the Swabian dynasty of the empire. It was only towards the close of minnesong that the lays were written. For over a century they were entirely preserved by memory. They were sung to the viol or to the guitar. (Tieck's "Minnelieder," Berlin, 1803; Taylor's "Lays of the Minnesingers," London, 1825.)

**MINNESOTA**, one of the United States of North America, extends from lat. 43° 30' to 49° N., and from lon. 90° to 97° W. British America forms its northern boundary. Lake Superior and the state of Wisconsin are on the east, Iowa on the west, and Dakota on the south. The length of Minnesota from north to south is 370 miles, and its width from 180 to 363 miles. Area, 83,531 square miles. The population in 1851 was only 6077; in 1881 it had increased to 780,807.

There is a variety of soils. A table-land, called the *Hauters de Terre*, runs from east to west in the north, and the other parts of the state alternate between sand-hills and swamps, beds of rivers, and prairies. There are no mountains, but altogether it is a very elevated country. The greatest height is 1916 feet above the sea, and the average is 1000 feet.

Minnesota abounds with lakes from 26 miles in extent to ponds scarcely a mile in circumference, well stocked with fish, and from which many rivers take their rise, flowing north, south, and east, and on the banks of many of these wild rice grows in abundance. The Mississippi rises in the north of the state, and flows through it for 800 miles, 500 of which are navigable—200 miles below and 300 above the Falls of St. Anthony. It is also traversed by the Minnesota River, and the Red River of the north skirts the state on the north-west. The Minnesota is navigable by steamers for 40 miles.

The climate is severe, especially in the north, but dry and equable; and on the whole Minnesota is one of the most beautiful, fertile, and salubrious states of the Union. The principal drawbacks are occasional droughts in summer and inundations in the low grounds in the spring. Agricultural pursuits are the chief occupation of the inhabitants, and the yield of wheat and other grain is equal in quality and amount to that of any other state in the Union. The state is rich in minerals, and there is a large number of railways. St. Paul is the capital.

Minnesota was constituted a territorial government in 1849, and admitted as a state in 1857. Powerful Indian tribes still occupy the more remote portions.

**MINNOW** (*Leuciscus phoxinus*) is the smallest English fish of the carp family (Cyprinidæ), belonging to the

same genus (*LEUCISCUS*) as the roach, chub, dace, &c. The minnow is widely distributed, ranging from Norway to Southern Europe and extending into North-east Asia. It is very common in rivers and streams in England, swimming in shoals, and furnishing food to almost every other freshwater fish. Its food consists of aquatic plants, worms, and scraps of animal substances. The minnow spawns in June on gravelly soil. Its usual length is about 3 inches long, but occasionally a length of 4 or 5 inches may be attained. The body is covered with numerous very small scales. The upper surface is of a dusky olive colour, becoming mottled and lighter on the sides. The belly is white, but in the males it becomes a bright red or pink during the breeding season. The minnow is used as bait for pike, trout, and large perch. It will bite freely at a small piece of red-worm. The flavour is said to be good when fried, if a sufficient quantity can be obtained by means of a casting net.

**MINOR** (Lat., less), a term used in music to express an interval a semitone less than a major interval. [See *INTERVAL*.] Hence minor is used to distinguish chords containing minor intervals, as minor common chord, minor Ninth, minor Thirteenth, &c. So also minor key, minor scale, when the Third and Sixth of the key and scale are minor intervals. See those various articles.

**MINOR, MINORITY.** A person is a minor, according to English law, when he is under twenty-one years of age. The term applies either to a male or female. The sovereign, however, is of full age at eighteen years. The term is derived from the Roman law, in which persons under twenty-five years of age (*minores viginti quinque annis or annorum*) were, to a certain extent, under the care of a curator.

**MINORCA**, the second in size of the Balearic Islands, Mediterranean, and the most easterly, lies 22 miles N.E. of Majorca. The island is 32 miles long E. to W.; 6 miles broad; and has an area of 335 square miles, and a population of 40,000. The coast, except on the S., is deeply indented, and has good harbours—Mahon, the capital, being one of the best in the world. The surface is undulating, and gradually rises from all sides towards the centre, where Mount El Toro reaches a height of 3740 feet. The soil is poor, and seldom yields a supply of wheat and oats adequate to the consumption. Among its products are wine, hemp, flax, oranges, lemons, saffron, wool, honey, &c. Iron, copper, and lead are found plentifully, but from scarcity of fuel are unworked; but marble, porphyry, and alabaster are exported in small quantities.

The ancient history of Minorca is nearly identical with that of Majorca. In 1285 the Moors were finally expelled from both islands, which were then formally annexed to the crown of Aragon. In 1708, during the War of the Spanish Succession, the English took possession of the island, with the intention of making it a naval station. It was confirmed to the British by the peace of Utrecht, and remained in their possession till 1756, when it was taken by a French fleet and army, after the failure of the attempt to relieve it by Admiral Byng, which led to his memorable trial and execution. At the peace of 1763 Minorca was restored to Great Britain, but in 1782 it was retaken by the Spaniards. It was once more taken by the British in 1798, and was finally ceded to Spain at the peace of Amiens in 1802.

**MINOS**, the lawgiver of Crete. The concurrent testimony of Thucydides and Aristotle shows it to have been the general belief in their times that Minos was the first among the Greeks who possessed any amount of naval power. According to Aristotle, he conquered and colonized several islands, and at last perished in an expedition against Sicily.

Some post-Homeric authorities make Minos a judge in Hades in company with Aiaikos, his brother Rhadamanthos



being chief judge. The word *minós*, like the Teutonic *man*, comes from a root signifying first to *measure*, and then to *think*. Minós is a son of Zeus—this being the usual method taken by the mythographers to express a person so ancient that they could put him on a level with no mere mortal—and from Zeus, as his father, he learns those laws which he afterwards delivers to men. His mother, in the legend, was Európa. Deukaliôn and Ariadné were his children.

There was also a grandson of this Minós who bore the same name, and was, like his grandfather, both king and governor in Crete. This second Minós incurred the wrath of Poseidôn by refusing to sacrifice a beautiful bull to him. The angry god inspired the queen Pasiphaë with a horrible passion for the animal, and she bore a bull-headed creature, hence called the *Minotaur* (Gr. *tauros*, a bull). Daidalos built a curiously intricate prison for the monster, called the *Labyrinth*. Theseus of Athens slew the Minotaur, going voluntarily to Crete for this purpose as one of the seven youths whom, with seven maidens, the Athenians were compelled to offer up to the monster every year as a punishment for some wrongs done by them upon the King of Crete. See THESEUS, and also ARIADNE.

**MINSK**, a town of Russia, the capital of a government of the same name, situated on the Swistocz, a feeder of the Berezina, is mostly built of wood, but has some stone edifices, and numerous Greek, United, and Roman Catholic churches, a Jews' synagogue, a theological seminary, and a theatre. It is the seat of a Greek archbishop and Roman Catholic bishop, as well as of the government of the province. There is some trade and a much-frequented fair. The population in 1882 was 53,228, among whom are many Jews.

**MIN'STER** (the Old English form of the Low Latin *monasterium*) is properly the church of a monastery, but in England and Germany this title is given also to several large cathedrals, as York Minster, the Minster of Strasburg, &c. The term is found in the names of several places which owe their origin to a monastery, as Westminster, Leominster, &c.

**MIN'STREL** (from the French *menestral*, and that in all probability from *ministrellus*, a diminutive of the Latin *minister*, servant) is a term applied to a class of persons who used to administer by their skill to the amusement of their patrons. The minstrels seem to have been the genuine successors of the ancient bards. They were held in great honour in the days of chivalry; but their popularity gradually declined, and before Elizabeth closed her reign their degradation was completed. By a statute in her thirty-ninth year, minstrels, together with jugglers, bear-wards, fencers, common players of interludes, tinkers, and peddlers, were included among rogues, vagabonds, and sturdy beggars, and adjudged to be punished accordingly.

**MINT**, the place where money is coined, from the Anglo-Saxon *mynet*, and that in all probability from the Latin *Moneta*, a surname of Juno, in whose temple at Rome money was coined.

The privilege of coining has in all ages and countries belonged to the state, and in England it has always formed part of the royal prerogative. Laws for the regulation of the mints can be traced back as far as the Anglo-Saxon period, and in the later Saxon and early Norman times a mint seems to have been established in every important town of the kingdom. In the reign of Richard I. the work of coining for the whole kingdom was concentrated in the mint of the Tower of London, but the Winchester mint seems to have been allowed to continue working for a long time afterwards.

An important reorganization of the coinage took place in the reign of Edward II., by whom the officers of the mint were formed into a corporation, consisting of the warden, master, comptroller, assay-master, workers, coiners, and

subordinates. These officials, known as moneyers, were always a privileged class, and they enjoyed certain special immunities in respect to rating, taxation, &c. It was the duty of the warden up to the reign of Charles II. to collect the seigniorage levied on the coining of money, which was calculated in such a manner as to fully cover the cost of the process and afford also a handsome profit to the king. The amount levied varied from time to time, but it formed no inconsiderable item in the royal revenue until its abolition by the Act 18 Car. II. c. 5.

The present system of coining money is of no older date than the year 1851. Previously to that time the coinage was performed by contract, originally by contract between the government and the master of the mint (or by sub-contract through him with the moneyers), and later, when the master had become a salaried officer and political adherent of the government for the time being, by direct agreement with the moneyers. In 1851 the contract system was entirely abandoned, and the work of coinage intrusted to competent officers acting wholly in the public interest. The result proved that the new system was preferable to the old, as it produced a superior class of coin, and was as economical as the old contract system. Some further important changes in the arrangement of the officers of the mint were made in 1870, when the mastership was annexed to the office of chancellor of the exchequer for the time being, the actual work of superintendence being intrusted to the deputy master. At the same time provision was made for the division of the work into two departments, the metallurgical, dealing with the assaying and metallic composition of the coins, and the operative, which deals with the melting and coining.

Up till the year 1810 the work of the mint was carried on in the Tower of London, but in that year it was transferred to a separate building which had been erected on Little Tower Hill at a cost, including the machinery, of £261,977. Up to this period the work had been done by machinery designed after patterns introduced in 1663, which, though effective, were of a cumbersome and primitive character; but when the new mint was erected, it was furnished with new machinery worked by steam engines constructed by Messrs. Boulton and Watt. At the time it was opened it represented one of the best minting establishments in the world, but for the next seventy years the machinery remained without material alteration, and though certain new appliances were introduced, when the Hon. C. W. Fremantle, C.B., was appointed deputy master in 1870, he found the machinery adopted in 1811 still in use, although during that time nearly every appliance of minting in other countries had been gradually changed. In the admirable series of annual reports on the mint issued by Mr. Fremantle, attention was repeatedly called to its defective arrangements and machinery, and in 1881 a bill for the acquisition of a site for an entirely new building was introduced into Parliament, and in due course referred to a select committee of the House of Commons. From the evidence given before that committee, however, it appeared that the work of coining might be suspended without danger for a time long enough to enable the old building to be reconstructed, and this course being preferred, the work was carried out between 1st February and 8th December of 1882, at a cost of £39,000, £30,000 of which represented the cost of new and improved machinery. It was found impossible to remove all the defects of the old building, but as under the new arrangement 1,000,000 coins can easily be turned out in a week, there can be no doubt of the capacity of the mint to meet any demand that may be made upon it.

The mint is bound to convert into coin all gold bullion of standard fineness brought to it for that purpose free of all charge for manufacture. Practically, however, the Bank of England is almost the only customer to the mint in

this way, owing to the facilities which that establishment possesses for managing monetary affairs. The Bank of England is compelled, under the Bank Act of 1844, to purchase bullion at the rate of £3 17s. 9d. per ounce standard, which bullion they dispose of to the mint at the rate of £3 17s. 10½d. per ounce standard. The private importer is precluded from disposing of his bullion directly to the mint, because the delay which takes place there in returning him his bullion in coin is greater than would be compensated for by the gain of the 1½d. per ounce standard which he would make by so doing. The profit made by the Bank of England is about £2000 on each £1,000,000 of gold coined. The metals required for the silver and bronze coinage are bought by the mint authorities direct, in such quantities as are necessary for the purposes of trade and commerce. The coinage of silver is practically regulated in accordance with the stock kept by the Bank of England, upon which the other banks draw as they require silver coins for their customers. Any merely local demand can be met by the transfer of the metal from one district to another; but when the stock of the bank is reduced by a general demand, the bank authorities give notice to the mint, and obtain from it a fresh supply. By the Act 56 Geo. III. ratified by Act 33 Vict., it is provided that there shall be 934 sovereigns and one ten-shilling piece contained in 20 pounds weight troy of standard gold, of the fineness of 22 carats fine gold and 2 carats of alloy in the pound weight troy; and further, as regards silver coin, that there shall be sixty-six shillings in every pound troy of standard silver, of the fineness of 11 ounces 2 pennyweights of fine silver, and 18 pennyweights of alloy in every pound weight troy. While gold coin is thus issued at nearly the market value of bullion, a profit is made on the silver coins, which amounts to 20 per cent. when silver is 55d. per ounce and to a correspondingly larger amount when that metal is cheaper. This profit may be set against the loss on the worn silver coins, and about £35,000 a year is spent in this way. The alloy used for the bronze coinage is composed of 95 per cent. of copper, 4 of tin, and 1 of zinc. The bronze coinage is very much depreciated in value, and the metal in 210 pennies is worth only a few shillings, but these coins are only struck for the convenience of making payments of small amount, and they are not legal tender for an amount above 1s. Silver is a legal tender up to 40s. only, while gold coin of full weight is a legal tender up to any amount.

**Coining.**—The gold received by the mint for conversion into sovereigns usually arrives in the form of ingots, each weighing about 200 ounces, while silver comes in the form of larger blocks of about 1000 ounces each. The operations incidental to the coinage of bronze and silver differ from those employed in the coinage of gold in some unimportant details only, so that it will just be necessary here to trace the course of the latter. The ingots are received at the mint office, where they are carefully weighed in a balance capable of turning with 1 grain when loaded with 1200 ounces. They are then submitted to the delicate process of assaying, after which they are sent to the melting house, and melted with the amount of copper or fine gold necessary to bring the metal to the fineness required by the standard prescribed by law. Crucibles of cast iron were formerly employed, but these were replaced in 1853 by wrought-iron pots, which since 1870 have been in turn abandoned in favour of crucibles made of a mixture of clay and graphite, each crucible being capable of taking a charge of 1200 ounces. When melted the alloy is cast into bars, four moulds being filled from a single charge of 1200 ounces. The bars are assayed to insure that the correct standard has been attained, and after being weighed they are carried to the rolling rooms, where they are passed in succession through a series of six pairs of rollers, by which

they are extended into strips or fillets 6 or 8 feet long. In some cases the fillets require to be annealed to remove the hardness caused by the repeated rollings, and they are sometimes, though not always, submitted to an appliance known as the drag bench, by which each fillet is reduced to greater uniformity of thickness by dragging it through an aperture very much as wire is drawn. The importance of accuracy in this part of the process may be estimated from the fact that a variation of 500th of an inch above or below the thickness required throws the coins cut from such a strip out of remedy. On leaving the drag bench the fillets are tested by the cutting of one or two test blanks from their sides, which are weighed on a delicate balance against a standard weight, and if these stand the test the fillets are passed on to a machine for cutting blanks, the perforated metal, termed *scissel*, being returned to the melting pot. Some attempts have been made to cut the blanks from cylindrical rods or bars of metal so as to avoid the production of *scissel*, but up to the present all such attempts have been unsuccessful. The blanks, after leaving the cutting room, are passed directly to an edge-rolling machine, by which the edge is thickened so as to form a rim, and then after being annealed, blanché in dilute sulphuric acid, washed, and dried, they are ready for the coining presses. From 1810 to 1882 the screw presses of James Watt were employed to stamp the coins, but in that year these gave way to fourteen lever presses on the Ullhorn system, which, working in comparative silence, impart the impression simultaneously to the obverse, reverse, and edge of the coin by a squeeze, as distinguished from the blow given by the old press. Blanks can be stamped into coins in one of these presses at rates varying from sixty to 120 per minute, ninety a minute giving the best results. After stamping, the coins are passed on to the weighing machines, where by means of beautifully constructed automatic balances they are divided into three classes, light, heavy, and good, the latter alone being permitted to pass into circulation. These balances are wonderful specimens of mechanical skill, turning readily with the one-hundredth part of a grain, each machine being capable of weighing and sorting twenty-three coins a minute. It is found in experience that no amount of care in rolling and cutting will produce coins of exactly the same weight, and this difficulty is recognized by the law, which allows a remedy or variation above or below the standard weight of a sovereign of ⅓ of a grain and ⅓ of a grain for the half sovereign. For the silver and bronze coinage a larger remedy is permitted. The coins which have passed the weighing test are next examined by ringing on a block of iron in order that any crack in them may be detected, and they are also examined for defects in workmanship by being passed, under the eye of a workman, on an endless band, which brings both sides of the coin under inspection. Samples of the coin are then handed to the assayer of the mint for a final trial of their fineness, and a certain number are also taken from each day's work for what is called the Pyx Chest, and every year, as enacted by the Coinage Act, 33 Vict. c. 10, an annual "trial of the Pyx," that is, an examination of the coins placed in the chest, takes place at the Goldsmiths' Hall, conducted by a sworn jury of members of the Goldsmiths' Company, who issue their verdict on the weight and fineness of the coins. It may be stated that this verdict has always been highly satisfactory, and has decisively proved the integrity of the gold and silver coinage of the realm. The coins are finally put up into bags containing 701 sovereigns each (180 oz.), and after a final weighing in bulk are ready to be sent to the Bank of England.

The machinery of the mint is driven by means of three vertical engines, constructed by Messrs. Maudslay, of 60 horse-power nominal, but working up to 250 horse-power. Two are in regular use, the third being kept as a stand-by.

These engines have been very skilfully designed for the peculiar work of the mint, in which there is an enormous variation in the power required from minute to minute, and by an ingenious piece of regulating mechanism, designed by the Honourable George Duncan, the power is so controlled that a variation of 80 per cent. scarcely makes the difference of one revolution in four minutes in the fly-wheels.

In addition to the manufacture of all the coin required for Great Britain, the English mint strikes gold coins of the value of two dollars each for Newfoundland; silver coins of the value of fifty, twenty-five, twenty, ten, and five cents respectively for Newfoundland and Canada; a nickel coinage for the West Indies; bronze coins, piastres, half and quarter piastres for Cyprus; silver twenty-cent, ten-cent, and five-cent pieces for Hong-Kong; one-third farthings for Malta; and various silver and bronze coins for Mauritius and the Straits Settlements. It also strikes all the medals required for the army and navy, as well as those given by the Royal Society, the University of London, and some other societies.

The Australian colonies are supplied with coin by branch mints established at Sydney and Melbourne, and by an Act of the imperial legislature all gold coins struck at these mints are a legal tender in Great Britain. India is supplied with coin by the mints of Calcutta and Bombay.

**MINT** is a plant well known as grown in gardens for culinary purposes. The Common Mint or "Spear-mint" (*Mentha viridis*) grows throughout the temperate regions of the northern hemisphere, though considering its cultivation from ancient times, it may in very many cases be merely an escape. Bentham considers it only a variety of the Common Wild Horse-mint (*Mentha sylvestris*). Mint was well known to the ancients; Ovid alludes to the practice of scouring the tables with the fresh herb, in order that the perfume should give an appetite. Pliny recommended that milk, before being drunk, should have mint placed in it, to prevent its curdling. An essential oil is obtained from mint, but it is not as strong as peppermint, though it suits some persons better. The plant is cultivated to a small extent at Mitcham, Surrey, and more largely in the United States. The genus *Mentha* belongs to the order LABIATÆ.

**MINUET** (Fr. *minuet*), a graceful slow dance introduced into England from France in the eighteenth century. The name comes from the *pas menus*, small steps of the dance. Musically it consists of two strains or parts, of eight bars each, in three-four time, both repeated. To extend the movement a second minuet, contrasted in character with the first, but of like form and extent, and called a *trio*, follows the minuet proper; and at the close of the trio (duly repeated in each part) the minuet is returned to and played straight through without repeats. A coda or finishing strain is often added to mark the close of the entire piece. The trio was originally written, for contrast, in three-part harmony, whence its name. When musical composers adopted the minuet and trio as a form of composition, the old eight-bar phrases received great extension, especially in the second half of the minuet, which often consists of twelve or sixteen bars or more. Thus modified the minuet still retains its place in the sonata and the symphony, where it forms the second or third movement. Beethoven often replaced it by a freer movement in four-four (common) time, which he called *scherzo* (jest), and his example is frequently followed.

**MINYÆ** (Gr. *Minyai*), an ancient Greek people of Thessaly, whence their hero, *Minus*, had led them into Boeotia. The greater part of the Argonauts were Minyæ. They enter into many legends, and evidently there have been important myths relating to them, but all have perished, and the subject is obscure.

**MIOCENE PERIOD** (Gr. *miœon*, less; *kainos*, new), the name proposed by Lyell, and now adopted by most geo-

logists, for those Tertiary beds containing in their molluscan fauna over 17 per cent. of existing species; recent species, thus, though forming a conspicuous feature, are still in a considerable minority. The conditions of deposition and the contained organic remains present great local variation even in the several Miocene basins of Europe; it appears, however, that the climate was tropical during the earlier part of the period, becoming later on more temperate; plants nearly allied to many of the genera still survive in India and Australia. The flora evidently was most luxuriant, a large percentage consisting of evergreens and plants with inconspicuous flowers. *Sequoia* allied to the gigantic trees of California form a conspicuous feature; those that may be noted are *Quercus*, *Ficus*, *Laurus*, *Cinnamomum*, *Daphne*, *Acer*, *Myrtus*, *Mimosa*, and *Acacia*, besides many others; in the woods, twining plants, such as vines and the Rotang-palm, were plentiful. Ferns also were well represented, and some of them were of large size. In the later stages the genera indicate a cooler climate. The fossil fauna indicates similar climatic conditions; among fossil shells the genera *Buccinum*, *Strombus*, *Cypræa*, *Murix*, *Cythera* (see PLATE NEOZOIC FOSSILS), and *Ostrea*, besides others, are conspicuous. The vertebrates all approached nearly to existing types; the reptiles comprised crocodiles, lizards, snakes, and turtles, while the amphibians were represented by frogs and toads. Among the mammals there are several important features. Marsupials (opossums) were then living in Europe; the three-toed pachyderms were dying out and being replaced by large proboscideans. Of these may be noted the gigantic *Mastodon* or primeval elephant; the *Dinotherium*, a great beast with long curved tusks projecting downwards from the lower jaw; the rhinoceros; and the *Anchitherium*, a beast about as big as a sheep and one of the precursors of the horse; allied to this were the *Meshippus* and *Miohippus* of America. The *Macrotherium* was a huge anteater, and the *Hyotherium* was allied to the hog; the *Helladotherium* was giraffe-like in structure. The sabre-toothed tiger *Machairodus* was a most formidable carnivore. Monkeys were numerous, both anthropoid, as the *Pliopithecus*, and long-tailed like those of India. The earliest bear, *Hyænarctos*, appears here, and many of our living genera were also introduced, such as the otter, antelope, beaver, and cat. In Swiss beds of this age the *Hipparion gracile* is found; it was a three-toed horse, the central toe only resting on the ground. From the Oeningen beds a most wonderful set of fossil remains have been obtained, consisting not only of the larger animals, but insects and plants, including flowers, fruits, and leaves, in regular succession, indicating the alternation of the seasons. These Swiss beds, which occur in the Molasse, are partly of freshwater origin and partly marine. At Vienna and in Carpentaria the Miocene forms a continuous series with the Pliocene, about 2000 feet thick; they are grouped together as *Neogene*, and are very rich in gasteropods. In Southern France the typical Miocene occurs in a series of local deposits known as the *Faluns*, consisting of shelly sands and marls that have been much used as fertilizers on the soil; they contain the remains of shells, corals, and numerous Mollusca, about 25 per cent. of which belong to species still living in the Atlantic or Mediterranean. In America marine Miocene beds also occur, the fauna of the eastern area being allied to that of the Atlantic, while in the west it pertains to that of the Pacific. In Great Britain no marine Miocene have been found; the upper beds in the Hampshire Tertiary basin are sometimes considered as of Miocene age, but later researches seem to place them with the Oligocene. The lacustrine deposit of Bovey Tracey is considered by some to have been a lake in Miocene times, but others consider the flora as closely allied to the Swiss Oligocene, while other authorities correlate it with the Bournemouth leaf-bed of Eocene age. Between

the basaltic lava flows of West Scotland and North-east Ireland there are several leaf-beds containing remains that fix their age as either Miocene or probably Oligocene.

In Miocene times the British area was probably a land surface with huge volcanoes—some possibly just extinct—in the north-western area: the north-west of the continent of Europe also probably was land, but a shallow sea connected the Bay of Biscay with the Mediterranean and extended north-easterly, projecting friths or straits to the north and east. This period was one of great upheaval or mountain making; the Alps, which had previously been upraised, were now further elevated. The upheavals from which have since been carved out the Himalayas and Andes were also formed. These vast movements were accompanied by evidences of great volcanic activity in Western Europe: a line of volcanic outbursts extends along the present bed of the Atlantic, from Spitzbergen towards the south pole, taking in the British area, and sending off lateral branches across Auvergne to the north of the Alps and on into Asia: another extended along the Mediterranean—where some remnants are still active—and on into Asia Minor. Although in our part of the globe volcanic forces were particularly active during this period, they can but be considered as migratory, for in many other parts of the globe they were dominant, although particularly rife at some previous period.

The earliest evidence of man is supposed by some to occur in Miocene strata; it consists of some very rude flint flakes and scratched bones. The indications are so very meagre and unreliable that few acknowledge them. The flakes probably have been produced by natural physical agencies, and the scratches on the bones by abrasion of pointed stones or the teeth of rodents.

The question of geological climates has been greatly complicated by the discovery in Arctic latitudes of Miocene flora, indicating at least a temperate climate. Thus in Spitzbergen, where now there is darkness for one-half the year and almost perpetual snow and ice, conifers abounded and several of our indigenous trees, hazel, elm, and birch, while water-lilies, reeds, and sedges grew in marshy places. In Greenland many of the plants agree with those found in the Miocene of Central Europe; they include Sequoia, Salisburia, oaks, beeches, planes, walnuts, and many others, while within about 8 degrees of the pole a bed of good coal has been discovered in strata of Miocene age, as testified by the abundance of plants agreeing with those of Spitzbergen.

**MIOLENIR**, in the Norse mythology, is the storm-hammer which the god THOR received from the dwarfs who made it for him; its blows as it descended, after being whirled round the head of the god, caused the rending lightning-stroke and the growl and roar of the thunder-echo.

**MIRABEAU, HONORÉ GABRIEL RIQUETTI, COMTE DE**, a celebrated French statesman and orator, and one of the most prominent figures of the Revolution, was born at Bignon, near Nemours, 9th March, 1749. He was descended from an Italian family of the Ghibelline faction, the Riquettis (Ital. *Arrighetti*), who settled in Provence in the thirteenth century, and after acquiring wealth as merchants, had their estate of Mirabeau raised to a marquisate by Louis XIV. All the race were characterized by a fearless temperament and a bold impetuous disposition. Victor Riquetti, marquis de Mirabeau, the father of Honoré, was a man of original views and of considerable abilities, an astute economist and independent thinker, whose works procured him recognition beyond the limits of France, and caused him to be regarded as the leader of a sect of political economists. At the same time he was possessed of intense vanity and obstinacy, and he treated his wife and children with persistent cruelty, causing in the course of his life no less than fifty-four *lettres de cachet* to be issued against them. Honoré was the eldest surviving son

of the marquis, and when born was a prodigy of size and ugliness. At the age of three he suffered from a virulent attack of confluent small-pox, by which his face was permanently seamed and scarred; but he grew up a tall and athletic young man, and in him the intellectual powers of the passionate Italian race attained their climax.

He was educated for the army, and in July, 1767, entered the regiment of the Marquis de Lambert. A quarrel with Lambert over a love affair led to his being imprisoned by his father for a year. On his release he obtained leave to join the French legion in Corsica, and attained the rank of captain. In 1772 he married the rich daughter of the Marquis de Marignane; but the union proved unsatisfactory to both parties, and in 1774 Mirabeau was separated from his wife. Having succeeded in further angering his father Mirabeau was confined in the Château d'If, off Marseilles, from September, 1774, to March, 1775, and afterwards in the fortress of Joux, near the old town of Pontarlier, in the desolate recesses of the Jura. Here he entered into an intrigue with Madame de Monnier, and induced her (in August, 1776) to leave her husband and flee with him to Switzerland and thence to Holland, where he gained a livelihood by hack work for the booksellers. In his absence he was tried for abduction at Besançon, condemned to death, and executed in effigy. In May, 1777, he was arrested, and imprisoned by a *lettre de cachet* in the Castle of Vincennes, where he remained three years and a half. He continued writing, producing first some obscene books, and afterwards his first political work of any value, his "*Essai sur les Lettres de Cachet*," published at Hamburg in 1782. He also conducted an impudenced correspondence with Madame de Monnier, which was given to the world after his death. Liberated in December, 1780—broken in health, but not less impetuous or resolute in spirit—he at once sought to procure the revocation of the sentence of death passed upon him; and he not only succeeded in this, but got the unfortunate M. de Monnier condemned in the costs of the whole law proceedings. He then commenced proceedings at Aix, claiming an order of court for the return of his wife; but though his pleadings gained for him considerable notoriety, they resulted only in a decree of separation. He then interfered on his father's behalf in a suit that was proceeding between his parents, and behaved so violently that he was compelled for a time to retire to Holland. He had previously quarrelled with and parted from Madame de Monnier, and in Holland he formed a connection with an educated Dutch lady, Madame de Nehra, to whom for the remainder of his life he remained constant, with such constancy as he was capable of. For the next few years of his life he gained a livelihood as a political pamphleteer, his writings, from the vigour of their style and boldness of opinion, attracting such attention as to cause him to be regarded as a leader of the assailants of the government. In 1786 the French ministry sought at once to silence and to make use of him by sending him on a secret mission to the court of Berlin. In this he failed to give satisfaction, and he was recalled in January, 1787. In 1788 he published a work in eight volumes on the "*Monarchie Prussienne*," the materials for which had been collected by a Major Mauvillon, whose acquaintance he had made on his visit to Berlin. In 1789, on hearing of the king's determination to summon the States-general, he applied to the assembly of the noblesse of Provence for election as their deputy, and being rejected, he offered himself as a candidate to the Tiers Etat, and was returned both for Aix and for Marseilles. He elected to represent the latter, and by his superb oratory and commanding intellect soon obtained vast influence. It was largely owing to him that the National Assembly was successfully consolidated. Occupying a sort of middle ground between the court and the people, between the advocates of the old monarchy and the furious partisans of a

democratic revolution, he had a difficult part to sustain, but he sustained it with unflinching intrepidity and consummate skill. In the autumn of 1789 the court opened negotiations with him, and though his counsels were rejected he continued in confidential relations with the queen and her most trusted advisers until his death. For the court he drew up many admirable memoirs and state papers, which give abundant evidence of his political sagacity, and he received in return some liberal payments of money, which enabled him to free himself from his encumbrance of debt. Though suspected he still maintained his power over the Assembly, and in February, 1791, was elected its president; but before this he had arrived at the knowledge that his end was near. The irregularities of his life had undermined his great physical strength. He was anxious to live, for he believed that he was the only man that could save his country from a terrible upheaval, and he declared mournfully that he was paying dearly for the sins of his youth. His friend, the celebrated physician and chemist Cabanis, did all that could be done to help him; but after some prolonged sufferings he died on the 2nd April, 1791. His popularity, which had been under a cloud, returned in full flood when it became known he was dying, and when he passed away all France seemed suddenly aware that in him had gone the only man of his time who understood the wants of his country and appreciated the exigencies of the crisis. He was interred with extraordinary pomp in the Pantheon, but his body was afterwards removed to make room for that of Marat.

A clear thinker, a powerful speaker, and a far-seeing statesman, he made a free use of other men's work, and found many friends who were glad to labour for him and allow him to take credit for what they had prepared. His obligations in this respect have been more clearly established than ever by the labours of recent biographers, but his superiority of mind and character is fully established by the fact that others were so willing to contribute to his power and influence.

His numerous works are most completely collected in the edition published at Paris in 1825-27 in nine vols. For an account of his life see "Mémoires Biographiques Littéraires et Politiques de Mirabeau," issued by his natural son, M. Lucas de Montigny, in eight vols. (Paris, 1834; second edition, 1841). See also Dumont's "Souvenirs sur Mirabeau" (1832); the letters between Mirabeau and the Comte de la March, published in 1851; and H. Reynald's "Mirabeau et la Constituante" (1873).

**MIRABILITE** is the hydrous sulphate of soda. It is found in efflorescent crusts, especially about hot springs, in certain volcanic districts, notably at Kailua in the Sandwich Isles. It is soluble in water, and many medicinal springs contain a small proportion of it. It crystallizes in the monoclinic system, the lamellæ being flexible but not elastic. These crystals quickly effloresce or become anhydrous on exposure and fall to powder. The artificial substance *glauher salts* is prepared in large quantities from common salt in the manufacture of carbonate of soda; it is used as a medicine, and known as *salts*.

**MIRACLE-PLAYS.** In the so-called Dark Ages, amid the universal wreck of culture, when it was well-nigh impossible to make common folk understand anything beyond the few ideas needed for their daily drudgery, it occurred to the good priests to dramatize events of the Bible, and so to bring them home to the people. Thus arose the miracle-plays, parents of our tragedy, and the MYSTERY-PLAYS and MORALITIES, parents of our comedy. Of these, although the mysteries were earlier known abroad, the miracle-plays came first into England, so far as we at present know, for we hear of them soon after the Conquest. A play on the miracles of St. Katharine, so Matthew of Paris tells us in his chronicle, was written by Geoffrey of Gorham, sub-prior of St. Alban's,

the monks providing the players with dresses and all that was needful. Now as this Geoffrey was made lord abbot in 1119, the play was in all probability produced not long after 1100. Matthew tells of it, because Geoffrey was then directing the subpriory of Dunstable, and the various copes and vestments which had been brought over there from the chief monastery at St. Alban's were all burned, together with Geoffrey's books, in a fire which broke out and destroyed the intended stage. We have no plays actually preserved of as early a date as this, but the date of our oldest plays is not more than half a century later. Two miracle-plays and one mystery still exist, which are the work of a monk Hilarius, written in France towards the close of Stephen's reign, or about the year 1150. In one of the former the famous miracle of the image of St. Nicholas is recounted, as it was acted on the saint's day in the Church of St. Nicholas. The image of the saint being removed an actor, dressed like the image, took his place on the pedestal. At the point of the service where ordinarily the miracle would have been recited a heathen man entered and laid treasure at the feet of the saint for protection. Then came thieves and stole it. The man returning, and finding his treasure gone, beat the (supposed) image with many blows. Whereupon the statue descended, sought out the robbers, and so worked upon their feelings that they restored all, after which it retired to its niche, and the heathen fell on his knees and was converted to the true faith. The service then continued to its close. This authentic piece is a very good specimen of the earliest and simplest miracle-plays, and the effect on ignorant peasants, while yet the drama was unborn, must have been stupendous.

In the town library of Tours is another set of three Anglo-Norman miracle-plays, nearly as old as those of Hilarius, in a MS. of the twelfth century; and here we get the first indication of the removal of the stage from the chancel to the outside of the great church-door, where a scaffolding was built, and all the people could assemble in the square and profit by the lesson. As complaints were made about the desecration of the graves, trampled by those who crowded the churchyard to get closer, the scaffold was erected away from the church altogether in the next century, though priests and monks still remained the actors, and the play was still regarded as a religious ceremony. In its nature a miracle-play was a production of one special church on its saint's day, and remained, therefore, always limited and serious in its tone; but the attempt to dramatize the Scriptures and the holy mysteries in general led to the far more important MYSTERY-PLAYS, which are fully described under their own heading.

The best recent treatment of this deeply interesting subject is in the "Shakespeare's Predecessors in the English Drama" of J. Addington Symonds (London, 1884).

**MIRAGE**, an optical illusion occasioned by the refraction of light through contiguous masses of air of different density. The illusions of the mirage differ according to circumstances, but they may all be arranged under one or other of the three following classes—vertical reflection, suspension, and lateral reflection.

In the *vertical reflection* the mirage presents the appearance of a sheet of water in which objects are reflected. It is this kind which is observed in Egypt, and which so cruelly tantalized the parched throats of the French soldiers during the campaign of Napoleon in that then almost unknown country. After the soil has become heated by the presence of the sun the prospect seems bounded by a general inundation. The villages beyond appear as islands in the midst of a great lake. Under each village its inverted image is seen as it would be if reflected from the surface of a sheet of water. On approaching, however, the deceptive inundation recedes and the reflected image vanishes, to be succeeded by another as some more distant object comes in sight.

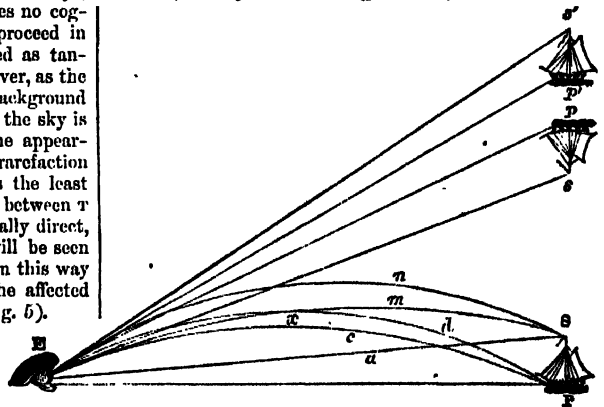
This kind of mirage is not peculiar to Egypt: it is known in Persia also, where it is called *Serab* or *Sir-ah* (miraculous water); and it is seen by those who cross the western deserts of India, where it is known by the name of *Tchittram* (picture). Biot has observed it on the sandy beach of Dunkirk, along the coast of the department of Calvados, at the Cape of Good Hope, and at the Shallut Pass in India. It is not, however, wonderful that it should be observed in other countries besides Egypt; it must always take place when the necessary circumstances concur to produce it without reference to geographical position. These circumstances are not of difficult explanation.

Suppose that  $c d$  (Plate, fig. 1) represents the level of the soil, which is very much heated by the sun, then the stratum of air immediately in contact with it will be rarefied, and the stratum next above that also, to a less degree, and so for succeeding strata, so that the air increases in density for a certain distance upward; at some point the rarefying effect will cease, density will remain normal, and will then begin to decrease upward according to the usual condition of the atmosphere. Under these circumstances, let us consider how the rays of light from an elevated object,  $A$ , will reach the eye of an observer at  $E$ . It is evident, first, that the eye will perceive the object directly by the rays in the direction  $A E$ ; these rays will not come absolutely straight; they will be slightly curved, which will give a slight elevation to the object  $A$ , as if the whole level were raised to  $a b$ ; but this deviation may be left out of consideration as regards the direction of the ray  $A E$ . The object  $A$ , however, transmits rays not only in the direction  $A E$ , but also in other directions, for instance towards the ground  $c d$ , and those at a certain well-known optical angle are refracted from their direct course as they enter the less dense inferior strata of air; so that, taking at first a direction inclined to the horizon, they are, by the continually lessening angles imposed upon them by the strata as these become denser and denser, at last so turned in their course as ultimately to be bent upwards and made to reach the spectator's eye at  $E$ . The spectator, therefore, sees the object by a direct set of rays  $A E$ , and by a set of refracted rays, denoted by  $I, K, L, M, N, O$ ; but as the eye takes no cognizance of curvature, it deems the rays to proceed in right lines, as  $n, e$ , which should be represented as tangents to their corresponding curves. And, moreover, as the rays from that part of the heavens upon the background of the object are refracted in the same manner, the sky is reversed as well as the object, and presents the appearance of a sheet of water. If the conditions of rarefaction are such that  $n m r$  is the greatest and  $n m s$  the least caustic curve of total refraction, then all images between  $r$  and  $s$  (figs. 2 and 4) will be seen double (vertically direct, and inverted refracted), but objects above  $r$  will be seen simple, and objects below  $s$  will be invisible. In this way a man walking away from the observer into the affected strata of air successively appears as in  $a$  to  $g$  (fig. 5).

This is the sum of the explanation given by Monge, on the occasion of the phenomenon being observed. That it is correct may be proved by a very simple experiment. Suppose we make a bar of iron—a thick poker—red-hot, and look along its surface at some object (say a letter or a word printed on a card, as in fig. 9), there will be seen an inverted image as well as the object itself; thus showing that the strata of air over the heated surface of the iron are affected in the same manner as the air incumbent upon the hot sandy plains of Egypt. A still better example is afforded by looking over the boiler of a locomotive on a cold still day. Something analogous is also observed in the tremulous appearance of the objects of a landscape, in a very clear warm day in our own latitude, although the phenomenon perhaps never attains so decisive a character as to warrant our classing it with the mirage of Egypt.

The mirage by suspension is equally remarkable, and takes place under exactly opposite circumstances from those explained. Perhaps the most celebrated example of this is the case described by Captain Scoresby, in which he recognized his father's ship, the *Fame*, by its inverted image suspended in the atmosphere, at a time when it was 80 miles distant, and consequently beneath the horizon. Sometimes the double image is seen, as in fig. 3. As the real ship rises above the horizon the inverted image descends to meet it, and the direct image disappears. The cause of this phenomenon is explained in the next paragraph. The famous *Fata Morgana*, visible at Reggio, which for many centuries astonished the ignorant and perplexed philosophers, is another instance of the same sort of phenomenon. When the sun's rays are thrown upon the bay at an angle of 45 degrees—the surface of the water being perfectly still, and the tide at its height—a spectator placed on an eminence in the city, with his back to the sun and his face to the sea and to the mountains of Messina, rising like a wall beyond it, on a sudden he will see numberless series of pilasters, arches, castles, columns, lofty towers, superb palaces with balconies and windows, extended alleys of trees, beautiful plains with all their herbage, herds and flocks, armies of men on foot and on horseback, and innumerable other objects, all in their natural colours and proper actions, passing rapidly in succession along the surface of the sea. These same objects are, in particular states of the atmosphere—when it is highly impregnated with vapour—seen in the air, though not so well defined; and when the air is slightly hazy and opaque they appear at the surface of the sea, but all vividly coloured or fringed with prismatic tints. All the images constituting this gorgeous phenomenon are derived from objects on shore by atmospherical refraction. Similar phenomena have been observed on our own coasts, and may occur in all latitudes, though some localities are more favourable than others for the full development of the illusion. The whole may be included in one explanation.

If the lower stratum of air be denser than the strata above it, the rays which diverge from it, in such directions



as to pass obliquely into the strata of changing density, will proceed in curves concave towards the earth; and, as before explained, when such rays meet the eye of a spectator, he conceives the object to be situated in the direction of a tangent,  $e s'$ , to the refracted ray  $e n s$ , and the object therefore appears as if suspended in the air. In the case here assumed we have supposed two suspended images, as frequently happens; and further, that the one is direct and the other inverted. The conditions necessary to this illusion are, that the rays diverging from each point of the object shall encounter strata of such densities that the eye may receive two sets by different paths. The rays  $s n$  and  $e c$ , reaching the eye, give by their tangents the image  $s' p'$ ,

but the rays  $s m$  and  $r d$  meet with such variation of density as to make them cross each other at  $x$ ; whereby  $r d$  is uppermost by the time they reach the spectator's eye, and their tangents consequently give the inverted image  $p a$ . The state of the air may be such as to give only one such image or many, and that whether the object is above or below the horizon. The elevation of coasts, mountains, and in fact all the phenomena which, when seen over a surface of the sea, we call *looming*, are instances of refraction comprehended in the explanation, and may constantly occur.

Wollaston invented an ingenious experiment for producing mirage effects. Filling a vial (fig. 6) with successive layers of clear syrup, soft water, and rectified spirit of wine, the effects shown are produced so soon as the fluids begin partially to mix at their surfaces, in layers of rapidly changing density, thus imitating the natural causes of the mirage. Writing on a card seen through the mixture at different levels becomes affected by the mirage distortion, the effect being reversed as regards the spirit and the syrup. The appearances last for several hours. An oblique line seen through such media becomes bent into the forms of figs. 7 and 8.

When vertical masses of air, instead of horizontal strata, are affected so as to produce different densities we have what is termed *lateral mirage*. It is by this lateral mirage that the French coast has been seen to approach almost into contact with our own; and that Dover Castle has been brought over and placed on the Ramsgate side of the hill. This kind of mirage is by no means of rare occurrence.

An example is shown in fig. 10, observed by Soret and Jurine on the Lake of Geneva at 10 a.m. in September, 1818, and well described by them. Here  $a b c$  is the shore of the lake,  $a$  being at Belle Rive;  $r$  is a small vessel opposite Belle Rive, the observers being about 6 miles off. As the boat tacked to the positions  $q, r, s$  successively, a series of laterally inverted images accompanied the motion at  $q', r', s'$ , the images removing further to the left of the line  $r c$  as the boat moved further to the right of it. Whenever the sun shone brightly the mirage became very distinct. The reason was easily discovered. The air to the right of  $r$  had been as usual in the shade during the morning, while that to the left of it had been heated by the sun, a nearly vertical plane separating the two for a short distance above the water.

The phenomena of the Enchanted Island, the Flying Dutchman, and other such inexplicable appearances which alarmed the superstitions of our forefathers, are of course all due to varieties of mirage.

**MIRANDOLA, GIOVANNI PICO DELLA**, Count and Prince of Concordia, a very famous classical scholar and elegant poet of the Italian Renaissance, was born in 1468, at Mirandola, in Modena, the youngest son of Giovanni Francesco Pico, Prince of Mirandola. He early lost his father, but his mother took every care of his education, and by fourteen he was entered a student of canon law at Bologna. Hence he travelled to all the universities of Italy and France (1477-84). In 1484 he went to Rome, being at this time the best Greek scholar of his day, and one of the few who had really mastered Hebrew and the leading Oriental tongues. Here he propounded 900 theses for public disputation. No one dared meet him, and the humiliated literati, in a mean desire for revenge, induced Pope Innocent VIII. to censure him for the heretical leaning of some of this host of questions. He was deeply wounded, and left Rome for Florence (1487). Here he was received warmly by the learned Lorenzo de' Medici, the Magnificent, who presented him with an estate near the city, in order to enjoy his society. He was still there when Lorenzo died (in 1492), and outlived him only two years. His complete works were at once printed (1496), but the best

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edition is that of 1601. They consist of poems and classical and theological treatises, of a very curious and elaborate kind. His nephew, Giovanni Francesco Pico (1469-1533), was the friend and biographer of Savonarola.

**MIRZAPUR**, the municipal city and administrative headquarters of Mirzapur district, North-western Provinces, British India. It is situated on the right bank of the Ganges, 56 miles below Allahabad, and 45 miles (by railway) above Benares. Up to quite recent years Mirzapur was the largest mart in Hindustan for grain and cotton; but of late its commercial importance has rapidly decreased, owing to the establishment of through railway communication with Bombay *via* Jabalpur, and the rise of Cawnpore to the position of a mercantile centre. The town has a handsome river front, lined with stone *ghats* or flights of stairs, and exhibiting numerous mosques, Hindu temples, and dwelling-houses of the wealthier merchants, with highly decorated façades and richly carved balconies and door-frames. The interior of the town, however, does not keep up the promise of the river-side, being mainly composed of mud huts. Large wells, of tasteful architecture, occur in the principal streets. The manufacture of shellac gives employment to about 4000 persons; brass-ware and carpets are also made. The population is about 70,000.

**MISDEMEANOUR**, in English and Irish law, is the name given to such crimes and offences as do not amount to a FELONY. It includes nevertheless some crimes of a grave character, such as frauds, assaults, perjuries, and libels, for which the punishment may be as heavy as that awarded to some felonies. The division of crimes into felonies and misdemeanours is unknown in Scottish law, but it is practically recognized in the distinction between graver and minor offences.

**MISH'NAH** (Heb., learning, from *shanah*, to learn, to repeat), the name given to the oral or second law of the Jews. In the interval between the redaction of the sacred writings by Ezra and the scribes who followed him, and the first centuries of the Christian era, the studies of the rabbis in the Mosaic law resulted in the growth of a vast collection of traditional interpretations and of legal decisions based upon the written text. These were not reduced to writing, but were carefully committed to memory, and, like some of the sacred books of the East, were in this way handed down through several generations. It is generally supposed that these interpretations and decisions, already known as the Mishnah, were first completely compiled and written down by Rabbi Jehudah the Holy, a Jew of great learning and influence who flourished in the second century of the Christian era, and was patriarch of Tiberias for over thirty years. Some modern scholars, however, while admitting that Rabbi Jehudah was one of the first and the best of the editors of the Mishnah, believe that the work itself was not committed to writing until a subsequent period, and that while it contains decisions of the rabbis given earlier than the Christian era, it contains also some that reach at least to the end of the third century.

The language of the Mishnah is that of the later Hebrew, very purely written, and though it contains many words of Aramaic, Greek, and Latin origin, these have been very skillfully Hebraized by the rabbis, so as to harmonize with the remainder. It is divided into six great divisions, termed *Sedarim* or orders, each of which contains a number of connected treatises, *Massekhtoth*, which are again subdivided into *Perakim* or chapters, and the smaller sections or paragraphs called *Mishnoth*. The six *Sedarim* run as follows:—(1) *Zera'im*, of agrarian laws, preceded by a treatise on thanksgivings. In this section the various tithes and donations due to the priests, Levites, and the poor from the produce of the land; the mixtures of plants, animals, and garments; the year of release and sundry minor matters, are dealt with. (2) *Mo'ed*, of sabbaths,



feasts, and fast days, dealing with work permitted or prohibited on them, with the ceremonies and observances by which they should be commemorated, and also of the sacrifices which should be offered. In this section there are special chapters for the feast of the passover, for that of the new year's day, of tabernacles, and of Purim; and one very important and impressive chapter dealing with the day of atonement. (3) *Nashim* (Women), treating of betrothal, marriage, marriage pacts and settlements, vows, divorce, &c. (4) *Nezikim*, commonly called *Nezikin* or damages, a section which includes the greater part of the civil and criminal law, the usages to be observed in courts of justice, oaths, punishments, &c. It also contains some profound and beautiful utterances of the wisest of the rabbis in reference to ethics. (5) *Kodashim* (Holy Things) deals with the laws of the sacrifices, the slaying of animals for food, the law of the first-born, the sins which are punished with excommunication, the measurements of the temple, &c. (6) *Tohoroth* (Purifications), a section treating of the various hygienic laws of the Pentateuch, of impure things and persons, rules of purification, religious washings, cleansing of vessels, &c.

Some of the injunctions of the Mishnah are believed by the Jews to come from Jehovah himself through Moses, Joshua, the elders, the prophets, and the men of the Great Synagogue; but many of them avowedly represent only the teachings of a majority of the rabbis, and the names and opinions of such as dissented are carefully preserved. Those injunctions only which have never been contested are regarded as having divine authority, all the rest are regarded as being open to revision.

There are many editions of the Mishnah known to Hebrew scholars, both as a separate work and as embodied in the Talmud, and it has been several times translated and printed. One of the best editions is that of Surenhusius, which with his Latin translation of the text was published at Amsterdam in six vols. folio in 1698-1708. A complete edition of the Mishnah, which forms the basis of the Palestinian Talmud, was issued under the editorship of Mr. W. H. Lowe at Cambridge in 1883.

#### MISPICKEL or ARSENICAL IRON PYRITES

is a combination of arsenide of iron and bisulphide of iron ( $\text{FeAs}_2 + \text{FeS}_2$ ). It is of a silvery white colour, but tarnishes quickly with a metallic lustre, and gives a dark streak. The specific gravity is about 6, and hardness almost 6. It crystallizes in rhombic prisms, but is often found massive. Mispickel is found associated with silver, copper, tin, and other pyritous ores; it sometimes contains up to 5 or 6 per cent. of cobalt. From it much white arsenic is prepared.

**MISPRISION** (from Fr. *mesprendre*, which means sometimes to deal improperly with, sometimes to treat with contempt) is a term used in English law in different senses.

Misprision of treason consists in withholding the knowledge of a treason committed or about to be committed, or in omitting to give information respecting it within a reasonable time to some public authority. It is a misdemeanour punishable by imprisonment for life, absolute forfeiture of personal property, and forfeiture during the life of the offender of the rents and profits of his real property.

Misprision of felony is a similar concealment in respect of felonies, and it is punishable by fine and imprisonment. In some if not in all cases of felony, the offender may be proceeded against for the minor offence, or misdemeanour, although a felony has actually been committed by him.

Misprision, in general, is the commission of such misdemeanours as are construed to involve a contempt of the royal authority or prerogative. Maladministration in high offices of public trust, though indictable as a misprision, is commonly, on account of its importance, made the subject of parliamentary impeachment.

**MISSAL** (Ecclesiastical Latin, *missale*, a mass-book), the name of the book which in the Roman Catholic Church contains the liturgic form of the mass with the various eucharistic services of the Christian year. In its present complete and authorized form the Roman Missal dates from the fifteenth and sixteenth centuries. Soon after the fourth century books called *Sacramentaries* came into use, containing not only the canonical form of celebrating and administering the Eucharist, but the prescribed ritual for administering the other sacraments, and the ritual as well for other solemn episcopal and priestly functions, such as the dedication of a church, the consecration of abbots, the public litanies, &c. A sacramentary was thus a missal, pontifical, and ritual combined. The earliest sacramentary mentioned in the Roman Church was the "Leonine," due to Pope St. Leo I. (440-61). This was completed by Gelasius I. (492-96); and the final and perfect form was given to it by St. Gregory the Great (590-604). Out of this Gregorian sacramentary grew the Roman Missal as ordered to be printed by the Council of Trent; it was edited and published by Pius V. (1566-72), and still more carefully revised by Clement VIII. (1592-1606) and by Urban VIII. (1623-44). These sacramentaries in the West, like their kindred Greek euchologies in the East, bestowed their chief care on the part containing the eucharistic service; and in this the canon was principal and centre. It was so called from a Greek word meaning a rule or law, and comprised that part of the mass immediately following the preface and ending just before the Lord's Prayer (*Pater Noster*), or, according to others, including also the Communion. This canon, from a very early date, and when the "discipline of the secret" was no longer necessary, formed a separate *codex* or book in each church. It was placed on the altar before the eyes of the celebrant, after the offertory; and this is still done whenever a bishop pontificates, as a reminder of the ancient custom. Beside the canon there were other *codices* called lectionaries, epistolaries, and evangelaries, which respectively contained appropriate passages from the Old Testament, selections from the New Testament Epistles, and Gospel readings in harmony with each feast of the year. These were not only in the hands of the clergy, but of the laity also; and of each sort of *codex* or volume very beautiful copies are still extant.

The Roman Missal, as it now stands, is that which received the last care of Urban VIII. The introductory portion contains the Roman Calendar, the rules for the Paschal Computation, the Rubrics of the Mass, and the prayers to be said by the priest as a preparation and as a thanksgiving. The "Proprium de Tempore," or the portion of the missal devoted to the Sundays, ferias, and feasts of the year other than saints' days, is placed first in order. It contains for the Sundays, ferias or week-days, and festivals, special introits, antiphons, collects (with secrets and post-communions), epistles, and gospels, together with the benedictions, hymns, and processional chants peculiar to solemnities like Candlemas, Ash-Wednesday, Holy Week, and the Vigil of Pentecost. Of this "Proprium de Tempore" one section begins with the first Sunday of Advent and leads up to Passion-tide, ending with the impressive services of Good Friday and Holy Saturday. Here, immediately after the mass of the Vigil of the Resurrection, is placed the "Ordinary of the Mass," the order of the liturgy proper, or eucharistic sacrifice [see MASS], from the antiphon-verse of Psalm xlii., "I will go in to the altar of God, to God who giveth joy to my youth," to the "Ite, missa est." It was fitting that the sacrificial rite ordered to be done "in remembrance of Him," should come after Holy Saturday, commemorative of Christ's burial, and immediately before Easter Sunday, the Feast of the Resurrection. The other section begins with Easter, and ends with the twenty-fourth Sunday after Pentecost.



The second part of the Missal is the "Proper of the Saints," following the days of the month all through the year from 29th November. The third is the "Common of the Saints," or masses appropriate to each class of holy personages, when no special mass is appointed for the occurring feast. At the end of this common are masses for particular occasions—public supplication or thanksgiving, matrimony, the dedication of a church, &c., and masses for the dead. Then follow collects, secrets, and post-communion prayers for every kind of public or private need. Add to these general divisions a supplement authorized by the Holy See for each of the countries of Christendom, with masses for national solemnities and local saints. A like supplement is allowed for each diocese, and for the saints of religious orders. The most ancient of these, Augustinians, Basilians, Benedictines, &c., have missals of their own, with some liturgical forms derived from the remote past.

Such, in brief, is the Roman Missal. Of the most ancient missals in use in national churches in communion with Rome, all were authorized forms, involving no doctrinal difference, no substantial deviation from the orthodox liturgy, but claiming ancient possession, and testifying to the liberty enjoyed by bishops to modify, in their respective dioceses, the accessories of public worship, while respecting the essentials. The ancient Gallican Missal, like the ancient uses or missals of Great Britain and Ireland, has been altogether discontinued. The Ambrosian rite in the diocese of Milan, and the Mozarabic in Toledo, are still authorized. The Eastern churches in communion with Rome are strictly obliged to preserve inviolate their ancient liturgies.

It was natural that Christian society should embellish with artistic tracery and painting the manuscript copies of the Scriptures and the liturgical books of every description. Most beautiful specimens of this early art of illumination are found in the Book of Kells, for instance. Later copies of sacramentaries, lectionaries, evangelaries, &c., are illuminated in a style of more advanced art. These are found in all continental countries, Italy being especially rich in them. This exquisite artistic ornamentation extended to the lay missals and books of devotion belonging to the laity, as well as to choral books of every kind. The art of illuminating, like Christian painting and sculpture, was born and fostered in the sanctuary.

**MISSAL THRUSH** (*Turdus viscivorus*) is a well-known British bird of the thrush family (Turdidae). The missal thrush is one of the largest of the British species of thrush, being about 11 inches in length. The upper surface of the body and the wings are varying tints of brown; the under surface is white tinged with yellow, and covered with numerous black spots, which are round in outline except on the throat, where they are triangular. The missal thrush is generally met with in small woods, orchards, and hedgerows; its food consists of insects, worms, and slugs, and in autumn and winter of fruits and berries, including those of the mistletoe, whence it derives its common name. The song of this thrush is far inferior to that of the song thrush, and somewhat resembles that of the blackbird; it is often heard before storms of wind and rain, and hence the bird is sometimes called the stormcock. The nest is built about April in the forked branch of a tree, and is composed externally of moss, grass, and lichens, and lined with a coating of mud, within which there is a layer of fine grass. The eggs are greenish-white, with reddish-brown spots; there are usually four or five of them in the nest. The missal thrush is a shy bird, but during the breeding season both the male and female exhibit a bold and quarrelsome demeanour. Two broods are produced in the season. This bird is a permanent inhabitant of Britain and most parts of Europe, and extends its range into

**MISSIONS.** In the history of the religious systems of the world we find that, while many of them, like ancient Judaism, have been regarded by their adherents as limited and national possessions, there have been others which have overleaped the bounds of nation and race, and have aimed at universal supremacy. Among the systems of the latter kind that of **Buddhism** occupies a foremost place, and in its origin and subsequent history we have a wonderful illustration of the influence of missionary zeal in the spread of religious ideas and practices. In the once powerful but now extinct system of **Manichæism**, and in the still active system of **Mohammedanism**, missionary labours are found as one of the prominent causes of their success; but as these subjects are treated elsewhere the present article deals only with the missions of the Christian Church.

From the book of the Acts of the Apostles we find that although the church at the outset limited its efforts to the Jews, and aimed only at the conversion of that people and the proselytes they had made, it had not been established many years before it had increased in the extent of its influence, and had made numerous converts from among people of other races. Some of these became at the same time proselytes to Judaism, and submitted to its initiatory rite, but after a somewhat prolonged contention within the church the latter conditions were dispensed with and the Christian converts were allowed to remain distinct from the Jews. This all-important victory opened the way for the preaching of Christianity throughout the world, and though in the books of the New Testament we have but few glimpses of the labours of the apostles, with the exception of the great apostle of the Gentiles, there is every reason to believe that they were all more or less missionaries of Christianity to many of the countries of Asia and Europe. As they passed away their work must have been continued by a band of zealous successors, for by the middle of the second century the influence of Christianity was felt throughout Asia Minor, Greece, Italy, Southern Gaul, and Northern Africa, and this influence continued to increase, until in 325 Christianity became the state religion of the Roman Empire. The period immediately following that event found the church busily engaged in consolidating its position, in refuting heresies within itself, and in the establishment of defined systems of doctrine and practice; but there also arose within its bosom many illustrious men who sought to emulate the zeal of the apostles, and continue the work of propagating Christianity in the earth.

In the early part of the fourth century Ulphilas, a converted Goth, afterwards consecrated a Christian bishop, laboured with much success among his countrymen, one result of his labours being the preparation of the **Mæro-Gothic** version of the Scriptures. In the year 404 Chrysostom founded at Constantinople a missionary college for the training of Goths for work among their own people, and about the same time Honoratus sent a band of enthusiastic missionaries to the shores of southern and western Gaul. During the fifth and three succeeding centuries, when the countless hordes of the Teutonic tribes poured forth from their forests and steppes, and overwhelmed the worn-out Roman Empire, the primitive missionary spirit of the church revived, and numbers of devoted men, burning with apostolic zeal, came out of their lonely cells and cloistered monasteries to preach the doctrines of the cross to these rude and fierce barbarians. The contest between the heathenism of Europe and Christianity was obstinate and prolonged, and even as late as the ninth century, when the Christian peoples were assailed by the Hungarians on the east, the Scandinavians on the north, and the Saracens on the south-west, the victory remained doubtful. Christianity is said to have been introduced into Ireland by St. **Palladius** and St. **Patrick** (Patricius) about 430-40, and these missions were sent to **Allan**, and St. **Columba** founded

the monastery of Iona, becoming the evangelizer of the Albanian Scots and northern Picts. From the churches thus founded devoted missionaries were sent to the tribes of Germany and north Europe, self-denying ascetic men, whose success was of the most remarkable kind. Among the more prominent names of this age we can only mention those of Augustine, who re-introduced Christianity to England about 597; Columbanus, an Irish monk, the apostle of the Burgundians of the Vosges, who died 615 and was succeeded by Callic or Gallus, and Kilian, who continued the work in Switzerland, Swabia, and Franconia; Amandus, Eloy, Wilfrid, Willibrod, and the martyr-brothers Ewald, who laboured in Holland and North Germany in the eighth century; Ansgar, the apostle of the north, the devoted pioneer of Christianity in Denmark and Sweden in the early part of the ninth century; and the great Boniface, whose labours in Germany extended over forty years.

In the work of spreading Christianity in Europe, however, it must be admitted that in many cases the people accepted it rather through the authority of the rulers than by persuasion of the truth; and the conversion of the chief was followed as a matter of course by the baptism of the whole tribe. In not a few cases also the new faith was imposed on conquered nations at the point of the sword. But when the savage and ferocious character of the idolatries against which Christianity was contending is taken into account, it will not be a matter of surprise that the military spirit was enlisted on the side of the church, or that certain semi-military semi-monastic orders should have played an important part in extending its influence. During the latter part of the mediæval period the missionary spirit slumbered for a while, but with the progress of geographical discovery some attempts were made to plant missions as part of the colonies founded in the New World. Unhappily the propagation of Christianity in Mexico and Peru was attended by cruelty and massacre of the most awful character, and there are few darker pages in human history than those which contain the story of the conquest of these countries. After the Reformation especially the Roman Catholic Church was aroused to fresh missionary activity, and zealous efforts were made by its adherents to recover lost ground in Europe and to extend the influence of the church in other parts of the world. The Jesuits from their first foundation have been pervaded by the missionary spirit, and the labours of Francis Xavier, Matteo Ricci, and others in India, Japan, and China, were rewarded by the accession of enormous numbers of converts. The methods adopted by the Jesuits, however, were repeatedly condemned by the papal authorities for their alleged compromises with heathenism. Towards the end of the sixteenth century they claimed to have had 150,000 converts, with 200 churches and fifty-nine religious houses, in Japan; but before the middle of the next century the whole work had been overthrown by means of wholesale massacres, in which, we regret to say, the Dutch assisted, for the purpose of obtaining a monopoly of trade with Japan. In India and China also their success proved more apparent than real, but they have never lost their hold upon these nations, and at the present day the Roman Catholic missions in both these countries are of a very extensive and important character. For the better working of the Roman Catholic missions a committee of cardinals was appointed to superintend them in 1622 by Gregory XV., under the name of the *Congregatio de Propaganda Fide*. His successor Urban VIII. supplemented the establishment of the Congregation by the foundation of the *Collegium de Propaganda Fide*, an important institution for the training of missionaries, which has ever since been the most perfect organization of the kind in the world. The funds of the Propaganda are contributed by Roman Catholics in all parts of the world, the annual income and expenditure amounting to over £200,000.

The Protestant churches of Europe were too busy with

the settlement of their own affairs and the protection of their rights, to bestow much thought upon missionary enterprise for some time after the Reformation; and even when they had become settled and established their efforts were few and feeble, until towards the close of the last century. The first Protestant mission seems to have been founded by the Church of Geneva, which sent missionaries to Brazil in 1556. In the following century some feeble efforts for the conversion of the natives were made by the Dutch at Ceylon, Java, Formosa, and Amboyna; while the English Church employed several missionaries, though with but little success, among the American Indians. The Royal Danish Mission College was established in 1614, but nothing effectual was accomplished in the way of Protestant missions till the second quarter of the eighteenth century, when the Moravians of Herrnhut led the way in this great enterprise, and sent forth a race of resolute missionaries to the frost-bound shores of Greenland and Labrador, to the rice swamps of Georgia, and the islands of the West Indies. The Society for the Propagation of the Gospel in Foreign Parts was established in England in 1701, but for many years did little more than assist in the support of a few Danish and German missionaries. The great religious revival of the eighteenth century, however, made its influence felt towards the close of that period, in the rapid development of missionary enterprise. In 1792, Andrew Fuller, Carey, and others, established the Baptist Missionary Society, which commenced its operations at Serampore, under Carey, Marshman, and Ward, when the British dominions were shut against them by the infamous policy of the East India Company. In 1794 a number of evangelical clergymen, episcopal and dissenting, founded the celebrated London Missionary Society, and two years after sent the ship *Juff* with nineteen missionaries and their families to carry the gospel to Tahiti and Tonga and other islands of the South Sea, where their labours were crowned with remarkable success. This institution, which subsequently established missions in South Africa, India, China, Madagascar, and the West Indies, still conducts its important operations on a thoroughly catholic basis. The Wesleyan Methodists, who had begun mission work in 1786, established a regular missionary society in 1813. The Church Missionary Society was established in 1799, the British and Foreign Bible Society in 1804, and the General Baptist Missionary Society in 1817. Since the commencement of the present century the development of missionary energy among the Protestant churches of Great Britain, the United States of America, and the larger British colonies, has been of the most extensive character, and the work at the present day is advancing yearly in the most remarkable manner. The most striking successes have been obtained in the missions to savage and barbarous peoples, such as those of the South Sea Islands, the negroes of Sierra Leone, and the Kafirs, Fingoes, Bechuanas, &c., of South Africa. In the islands of the Fiji group, formerly notorious for their cannibalism, bloodshed, and cruelty, the governor, Sir A. Gordon, was enabled to report in 1879 that out of a population of 120,000, 102,000 were regular worshippers at the churches, while over 42,000 children were in attendance at the day schools. The missions directed against the old and strongly entrenched religions of India and China and the system of Mohammedanism have been less successful. To survey even in outline the extent of the missionary field at present covered by Protestant missions would be impossible within the limits of this article; but it may be mentioned that the amount raised in Great Britain alone for foreign missions by the different societies considerably exceeds £1,000,000 per annum, and it is estimated that the converts from heathenism—not counting those of the Roman Catholic missions, statistics of which are not available—amount at the present period to nearly 2,000,000 persons.

**MISSISSIPPI, THE** (or "Great Water," as the term signifies in the native language), one of the largest rivers on the globe, has its sources in a lake a few miles south of Lake Itasca (its supposed source till 1881), in lat.  $47^{\circ} 18' N.$ , at an altitude of 1578 feet above the Atlantic Ocean. From Lakes Itasca and Usawa two small streams issue in a northern direction, which unite, after a circuitous course of 50 or 60 miles, in  $47^{\circ} 38' N.$  lat. The united stream falls into Lake Travers, which is about 12 miles long from north to south, and six or seven broad, and is the most northern point attained by the river. Issuing from the eastern side of this lake the river flows south-east to Cass Lake. From Cass Lake it still runs in an easterly direction to Little Winnipeg Lake, from which its south-east course begins.

Issuing from Lake Winnipeg, the Mississippi flows with great velocity, and assuming a southern course it winds through the United States to the Gulf of Mexico, which it enters by a delta of several mouths at lat.  $29^{\circ}$ . Having thus flowed through eighteen degrees of latitude, and separated the states of Wisconsin, Illinois, Kentucky, Tennessee, and Mississippi, on its left or eastern bank, from those of Minnesota, Iowa, Missouri, Arkansas, and Louisiana, on the west, it discharges chiefly through an alluvial delta which stretches for upwards of 60 miles into the sea. The waters of the Upper Mississippi are remarkably clear, but after commingling with those of the Missouri, which joins it about 12 miles above St. Louis, they become exceedingly turbid, and contain nearly one-third of sediment. The entire length of the river is more than 3200 miles, or reckoning from the source of the Missouri, nearly 4200 miles. The mean discharge of water from this enormous river is 675,000 cubic feet per second, by which 3,627,200,000 tons of sedimentary matter are yearly transported to the Gulf in a state of suspension, constituting one square mile of deposit 241 feet in depth. Besides this, it pushes into the sea large quantities of earthy matter, probably amounting to about 750,000,000 feet annually. The area drained by the Mississippi is about 1,244,000 square miles, nearly one-seventh of North America, and equal to more than one-third of Europe. This vast region, from its almost unexampled fertility, has obtained the title of the "Garden of the World." The river is extremely winding in its course: sometimes a bend of 80 miles occurs, where the distance across the neck does not exceed a mile. This tends to check the current, and facilitates navigation. Steamers, however, make the passage from Cincinnati to New Orleans and back in less than twenty days. The river is computed to offer not less than 36,000 miles of uninterrupted steam navigation. It is a remarkable feature that, flowing from north to south, it has such a variety of climate, and consequently of productions, in the different parts of its basin, from the hardier cereals of the north to the almost tropical growths of the south. As spring advances from the south, it releases in succession the snows of the more northern states. The annual swell of the waters is in consequence gradual and long continued, commencing usually about the end of February and continuing till June, when they begin to subside. To prevent the inundating of the country immense lengths of embankments or "levees" have been formed, of massive construction; but the great impetus of the river has often caused it to burst through, to the great destruction of life and property. The great hindrance to Mississippi navigation is the numerous bars at its mouth, formed by the heavy deposit of mud brought down by the waters; but the United States government is now devoting large sums to the improvement of the navigation of the whole river. Above its junction with the Missouri the Mississippi flows through a picturesque and beautiful country, but below that point it loses its picturesqueness. Its principal tributaries are:—On the left, the St. Croix, Chippeway, Wisconsin, Kas-

skia, Illinois, and Ohio, which receives the Tennessee, Cumberland, Wabash, &c.; and on the right, the St. Peter's, Iowa, Des Moines, Missouri, St. Francis, Kansas, Arkansas, and Red River.

**MISSISSIPPI**, one of the United States of North America, is bounded N. by Tennessee, E. by Alabama, S. by the Gulf of Mexico and Louisiana, and W. by Louisiana and Arkansas. Its length N. to S. is 330 miles, and its average breadth about 100 miles. The area is 46,340 square miles, and the population in 1880 was 1,131,899.

The surface in the south and west is flat and marshy; but the east and north of the state is a tolerably elevated region. Much of the land in the state is exceedingly fertile. The sea-coast extends for about 90 miles, but the only good harbour is that formed by the roadstead inside Ship Island. The coast is sandy but well timbered, and is considered one of the most healthy districts in the world.

The Mississippi forms the western boundary, and the Yazoo has its whole course in the state. Several of the smaller affluents of the Mississippi also rise and terminate in it. As the surface rises from a low shore to 500 feet and upwards in its northern districts, a great difference of climate prevails in the various regions, especially as the northern districts are nearly 5 degrees from the southern. Along the southern coast frost is of rare occurrence in winter, and the heat of summer is tempered by the sea breeze from the Gulf of Mexico.

The principal objects of cultivation are cotton and Indian corn. Wheat, rye, and oats do not thrive so well as in the northern states, and are only cultivated for home consumption. Sugar is grown in the south, and among the other products of the state are indigo, melons, grapes, plums, peaches, figs, and other fruits; also tobacco and timber.

The industries include lumber, cotton and woollen goods, oil, and agricultural machinery. The fertile tract along the Mississippi, which produces cotton and Indian corn, sends these articles down to New Orleans, whence it is supplied with goods of foreign growth or manufacture.

The first settlements were formed in the neighbourhood of Natchez by some Frenchmen in the beginning of the last century, but they did not thrive. When the country was ceded to the British in 1763, some respectable settlements were founded in the same parts, but later on, coming under the sway of the Spaniards (1763 to 1800), they again began to decline. In 1800 all that is now comprised in Mississippi and Alabama was formed into a territory by the name of Mississippi Territory. In 1817 this territory was divided into two portions, and the western was admitted into the Union as the state of Mississippi. The present constitution was formed in 1832. In the Civil War the state joined the Southern Confederacy.

**MISSISSIPPI COMPANY.** See LAW, JOHN.

**MISSOURI** is the largest of the affluents of the Mississippi. The name is first given to the more northern of two streams in which all the waters descending from the eastern declivity of the Rocky Mountains between  $42^{\circ}$  and  $49^{\circ} N.$  lat. unite. It rises near  $44^{\circ} N.$  lat., and after a northerly course of 400 miles meets the Yellowstone River, which rises between  $43^{\circ}$  and  $44^{\circ} N.$  lat. The Yellowstone runs first N.N.E. and then E., approaching gradually to the Missouri, which it joins after a serpentine course of 700 miles. About 400 miles from its source the Missouri is compressed to a width of 150 yards for a distance of 6 miles, by precipices which rise from the water's edge to a height of 1200 feet. This wild gorge is called "the Gate of the Rocky Mountains." More than 100 miles below this occur the Great Falls, where the river is precipitated over five ledges, one of which is 75 feet in height, and the others respectively 12, 42, 6, and 25 feet. These falls are considered among the grandest in North America. The course of the Mis-

souri throughout is rapid, and its waters turbid (the name itself signifies "Mud River"); but no serious obstacle is presented to navigation from its mouth to the falls, a distance of 2570 miles, except perhaps shallows during the season of drought. The Missouri is a larger river than the Mississippi prior to the junction between them; but as the former was the first explored, the waters below that point received and retain the name of the Mississippi. The total length of the Missouri from its source to its junction with the Mississippi is 2908 miles, to the Gulf of Mexico 4194 miles.

**MISSOURI**, one of the United States of North America, is bounded N. by Iowa, E. by Illinois, Kentucky, and Tennessee, S. by Arkansas, and W. by the state of Kansas, the Nebraska and Indian Territory. Its mean length from N. to S. is 280 miles, and its mean width from E. to W. 225 miles. The area is 65,350 square miles. In 1880 the population was 2,169,091.

In the southern part of the state an extensive bottom-land extends along the Mississippi, as far north as opposite the mouth of the Ohio. It includes many large swamps, which are rendered almost impenetrable by a dense growth of trees, mostly cypress. The most extensive of these swamps, called the Great Swamp, commences near the head of the bottom and passes southward to the mouth of the river St. Francis, penetrating far into the state of Arkansas. The high grounds along the Mississippi begin 12 miles below Cape Girardeau, and extend to the mouth of the river Missouri. This undulating country extends westward to the river Gasconade, occupying the basin of the Maramec as far south as the lead-mining district. It is diversified with many extensive prairies and forests, the lower lands being well wooded, but the high grounds very thinly.

Between the rivers Gasconade and Osage, both of which are affluents of the river Missouri, a range of low hills approaches the Missouri, rising from 150 to 200 feet above the level of its water. They are thinly wooded, and constitute the most northern offset of the Ozark Mountains, which rise to 2000 feet. The country west of this mountain region, especially the basin of the Osage, resembles that which is east of the river Gasconade, its surface being undulating and diversified with woodlands and prairies. The prairies occupy by far the largest part of the surface. This region, however, does not extend to the banks of the Missouri, being separated from it by a rich alluvial soil, which extends along the river from the mouth of the Osage to that of the Mine River, with a width of 4 or 5 miles. This bottom is probably the most fertile portion of the state. Opposite to it extends a similar bottom-land along the northern banks of the Missouri from Côte-sans-Dessain to the river Chariton. In the country north of the Missouri, which comprehends about one-third of the state, the fertile tracts are nearly exclusively confined to the bottoms along the Missouri and Mississippi.

The **MISSISSIPPI** washes the eastern boundary for 550 miles, and the **MISSOURI** traverses the state from west to east. The Grand River and the Chariton fall into the Missouri on the north bank; the Gasconade, Osage, and Mine River fall into it on the south. The Maramec and Salt River are affluents of the Mississippi.

The climate of Missouri is cold and extremely variable. The winters are severe and long. The Missouri is frozen so hard for several weeks as to be safely crossed by loaded waggons. The summers are often hot, but very variable.

Tobacco, cotton, maize, wheat, rye, oats, and barley are the staples of Missouri. The soil and climate adapt the country to yield all the products of the southern states, except sugar, as well as most of the vegetables and fruits of England. A little hemp and flax are cultivated along the Mississippi, and cotton is grown in the south. Cattle abound where the bottoms and prairies are near one another.

In summer they feed on the grass of the prairies, and in winter on the cane and rushes of the alluvial soil. Horses and hogs are numerous. The bison is met with in large herds on the prairies east and west of the Ozark Mountains, and also elk and deer. The fur trade is considerable.

The minerals chiefly consist of lead, coal, iron, copper, and salt. The principal lead region is on both sides of Big River, an affluent of the Maramec, and extends about 100 miles in length by 40 in width. The ore is of the richest quality, and very abundant. Iron ore exists in mountainous masses 200 and 300 feet high, and some of them yield 80 per cent. of metal. Coal exists in several places. There are also numerous other minerals and marbles.

Much wine is made by the large German population in the state. There are also woollen and cotton factories, iron-works, breweries, distilleries, and tanneries. The principal export trade is in beef, pork, tallow, hides, and live stock, with lead, furs, timber, and Indian corn. The western towns supply caravans or trains to New Mexico, Utah, and California.

Though this country for more than a century had been visited by the French from Canada, no settlement was formed before 1763. St. Louis was founded in 1761. In 1803 the United States obtained possession of the region, which was then comprehended in Louisiana. The following year the state now called Louisiana was separated from it, and Missouri became a separate territory. In 1821 it was admitted as a member of the Union, and formed its constitution. The state of Missouri joined the Southern Confederacy in 1861, and was the scene of many conflicts in the War of Secession.

**MIST**, aqueous vapour, rendered visible by the temperature of the air being so far reduced as to precipitate some of the vapour in minute liquid particles. When the mist is very thick it is called a *fog*; but it is rather paradoxical that a mist is always wetter to the feel than a fog. Perhaps the reason is that the particles of moisture are larger in mists than in fogs. See also **FOG**, **DEW**, **CLOUD**.

**MISTLETOE** (Anglo-Saxon *mistletoen*), a parasitical plant which flourishes on the branches of many kinds of trees in Northern Europe. It is the *Viscum album* of botanists, and is frequently found on the apple, and less often on the oak in the west of England. In its natural state it is believed to be propagated by the mistle thrush, which feeds upon its berries. Artificial propagation is effected by bruising the berries, and, by means of their viscosity, causing them to adhere to the bark of fruit trees, where they readily germinate and take root. The leaves or shoots of the mistletoe, reduced to powder, have been employed in epilepsy. The plant belongs to the **LORANTHACEÆ**. The Druids regarded it with peculiar reverence. At the commencement of the winter solstice a festival was held, when the Druids and the people went forth with great pomp and rejoicings to cut the mystic plant. Its appearance on the tree was held to betoken the presence of the god of healing, the Druidic Apollo, the many-named Belenus, Barvo, Grannus, &c. [See **DRUIDS**.] In the Norse mythology it is the mistletoe, weakest of trees, unable to stand alone, which yet furnishes the shaft for the spear with which the blind Hödur killed Baldr, god of light. See **BALDR**.

**MISTRAL** or **MAESTRAL** is a north-west wind which prevails on the south coast of Europe at certain times of the year. The Italians call it *Maestrale*, from the Lat. *Magistralis*, the masterful wind. The signs of its approach are a sudden change of temperature from warm to cold, a clear sky, and, if at night, an extraordinary brilliancy of the stars. The wind dries up the soil, disperses the vapours of the atmosphere, causes much damage to the fruit trees in blossom, and raises a tumult in the waters of the Mediterranean, which is much dreaded by the French and Italian sailors.

**MITE** is the name commonly given to small arachnids forming the order ACARIDÆ, but often restricted to a family of that order, Acaridæ. The Acaridæ or true mites are among the lowest types of the Arthropoda. Many of them are parasites, living on or under the skin, within the lungs and air passages, the muscles and bloodvessels, of other animals. Others, again, live in decaying animal and vegetable substances, in unrefined sugar, flour, cheese, &c. They are very minute, the body is soft, and the skin thin. The jaws are nipper-like or pointed, in the latter case being retractile into a horny sheath; and there are no eyes. The claws are sometimes provided with suckers. The cheese-mite is *Tyroglyphus tiro*, belonging to a genus which includes several other injurious species, as *Tyroglyphus sacchari*, found in unrefined sugar, and *Tyroglyphus farinae*, found in flour. The IRON-MITE (*Sarcoptes scabiei*) also belongs to this family. One of the most degraded forms is *Demodex folliculorum*, which occurs in the hair follicles and sebaceous glands of the human skin, especially in those of the nose, and is doubtless the "maggot in cheese-monger's nose" of Butler's "Hudibras." It is a minute, slender, elongated, worm-like mite, with a suctorial mouth, and bearing in the anterior part of the body four pairs of very short legs, each of which terminates in two claws.

**MITFORD, WILLIAM**, a historian of some celebrity in his day, was born in London, 10th February, 1744. He studied at Oxford, but left without taking a degree. In 1769 he made the acquaintance of Gibbon, and it is supposed that his intercourse with that historian induced him to undertake his own literary work. His chief work, a "History of Greece," was published in successive portions between 1784 and 1818. It is now entirely superseded by the works of Grote, Thirlwall, &c. Mitford died 8th February, 1827.

**MITFORD, MISS MARY RUSSELL**, a celebrated novelist, was born at Alresford, Hants, in 1786. She was the only daughter of a physician, whose extravagant habits reduced his daughter to the necessity of seeking the means of subsistence by the labours of her pen. Of her first appearance as an authoress she thus speaks in her autobiographical memoir—"In my very early girlhood I had followed my destiny, as a pupil of Miss Rowden, by committing the sin of rhyming. No less than three octavo volumes had I perpetrated in two years. They had all the faults incident to a young lady's verses; and one of them had been deservedly castigated by the *Quarterly*." When the first series of "Our Village," on which Miss Mitford's fame is chiefly built, made its appearance in 1806, it received a very favourable notice from the same review. To these delightful sketches other four volumes were added, and the fifth and last appeared in 1832. In 1852 she produced her "Recollections of a Literary Life," in three volumes; and in 1854 her dramatic works, "Julian" (1828), "Foscari" (1826), "Rienzi" (1828), and "Charles the First," were collected in two volumes 12mo. She died in 1855. Her "Life," told by herself in letters to her friends, edited by the Rev. A. G. L'Estrange, with an introductory memoir by the Rev. W. Harkness, was published in 1870.

**MITHRADATES**, a common name among the Medes and Persians (from *Mithras*, the Persian name for the sun). The name was written in several ways. On the Greek coins it is written Mithradates. The most celebrated race of princes of the name were the kings of Pontus, descended from Artabazus, one of the seven Persian chiefs who overthrew the Magi (A.C. 521). The Mithradates who figures so largely in the history of the close of the Roman Republic was King of Pontus from 120 to 63 B.C. He is styled *Eupator*, and also "The Great." He ascended the throne as a boy of eleven, and at once had to use all his extraordinary abilities and address against his faithless guardians. He so saturated himself with antidotes to poisons, in consequence of the frequent attempts to make

away with him, that (so the tale runs) he was impervious to all poisons known. He became one of the most skilled athletes of his time, and as for his culture, the simple fact that he was accustomed to transact business in all the twenty-five languages and dialects spoken in his vast dominions shows the great extent of his learning. As soon as he wielded supreme power he extended his empire over Colchis and beyond the Caucasus, annexed the Tauric Chersonesos (Crimea), and eventually the kingdom of Bosphorus itself. His empire now inclosed the Euxine (Black Sea), and he aimed at nothing less than rivalry with Rome. In 88, therefore, he attacked the Roman provinces of Asia and Phrygia, Galatia, &c. (Asia Minor), and speedily became their master. At his command all Asia rose against the hated masters of the world, and 80,000 Romans and Italians perished in one massacre. Rome was beside herself with rage. Her greatest commander, Sulla, was despatched at once through Greece against the foe. The main forces of the king met those of Sulla in Greece, and were twice completely defeated—at Chaironeia and at Orchomenos—while the king himself was overthrown by the legate Fimbria in Asia (B.C. 87). Mithradates sued for peace, and as Italy had revolted against Sulla's government in his absence he was fortunate enough to obtain it (B.C. 84) at the price of all his conquests, eighty ships, and a fine of 3000 talents (£732,000) in gold. Sulla's lieutenants annoyed Mithradates after their general's departure by petty incursions, till Sulla peremptorily ordered them to cease (B.C. 82); and this is sometimes called the second Mithradatic War. The third and greatest war arose over the inheritance of the kingdom of Bithynia, which the Romans claimed, while the King of Pontus supported the native heir. He had by this time (74 B.C.) got together a large army of nearly 200,000 men, all trained on the Roman model, and with this powerful force he succeeded in utterly defeating the Roman consul, Cotta, at Chalkedon, and then lay siege to Kuzikos (Lat. *Cyzicus*), in the Sea of Marmara. The other consul, Lucullus, compelled him to retreat with great loss (B.C. 73), and in the next year followed him and thoroughly defeated him. Mithradates fled to his son-in-law, Tigranes, king of Armenia. Lucullus followed him in 69, and both in that year and the next defeated the two kings in critical engagements. But as soon as he retired Mithradates gathered strength, and the year 67 saw him in possession of the greater part of his original kingdom. Cn. Pompeius (Pompey the Great) was next sent out, and under his vigorous command Mithradates was again driven into exile. With a small army he now marched round to the head of the *Palus Mæotis* (Sea of Azof), whither Pompey declined to follow him; and he was preparing to invade Italy by land when a determined rebellion among his troops foiled all his plans. He quickly found himself a prisoner in the tower in which he had taken refuge, and seeing all was lost he vainly tried to destroy himself with poison. But he had long since made himself proof against all poisons, and at last he called in an attendant, who at his request despatched him by the sword (B.C. 63). Cicero, his contemporary, considers him the strongest opponent the Romans ever had, and the greatest ruler since Alexander.

**MITHRAS**, the sun-god of the Persians, which they worshipped as the purest emblem of the divinity. This solar creed spread over a great part of Asia, and under various forms extended throughout Europe. On the revival of the Persian religion under the Sassanids, the mysteries and festivals of Mithras were celebrated with great splendour. In ancient statuary he is represented as a young man with a turban on his head and kneeling on a prostrate bull, one of the horns of which he holds in his left hand, while with the right he is plunging a dagger into the animal's neck. The worship of Mithras was introduced into Rome soon after the fall of the republic, and maintained a certain

position among the multifarious "fancy creeds" of the pagans until Christianity became triumphant.

**MITHRIDATES.** See MITHRADATES.

**MITRAILLEUSE.** See GUN.

**MITRE** (Lat. *mitra*, a head-band or diadem), the crown or pontifical ornament worn on the head by archbishops and bishops, and in some instances by abbots, upon solemn occasions. It was adopted by the hierarchy in the seventh century, and its peculiar form, divided at the sides and pointed in front, is believed to be a symbol of the cloven tongues, "like as of fire," which sat upon each of the apostles on the day of Pentecost. The Pope has four mitres, called *tiaras*, which are more or less rich, according to the solemnity of the feast days upon which they are to be worn. Mitres have not been worn in England since the Reformation, but are used as a heraldic ensign, surmounting the episcopal coat of arms. They are not in use in the Greek Church.

**MITRE-SHELL** (*Mitra*) is a genus of gastropodous molluscs belonging to the family Volutidae. The mitre-shells have an elongated, thick shell adorned with brilliantly-coloured bands, with a conical, elevated spire, compressed whorls, and a small aperture; the operculum is very small, and often wanting. The foot is small, folded longitudinally when contracted. The proboscis is generally very long and large, that of *Mitra episcopalis* being more than one and a half times the length of the whole shell, and capable of being projected to the distance of five inches. The species are numerous, 420 having been described, found chiefly in tropical seas, ranging in low water from 15 to 80 fathoms. When irritated, some of them emit a purple fluid, having a nauseous odour. The fossil species are numerous, commencing in the chalk. Some of the fossil species are described from Britain and France.

**MITTIMUS**, in the law of England, a term applied to certain writs and warrants in which the word *mittimus*, "We (the king) send," is expressed or implied. The term is given to writs issued for the removal and transference of records from one court to another, and also to precepts or commands in writing directed to the keeper of a prison for the receiving and safe keeping of an offender.

**MITYLENE.** See MYTILENE.

**MIXTURE** is the name of a class of stops in church organs, each stop of which consists of several small ranks of pipes, from two to five, so that every note produces in reality a chord of a certain composition, varying according to the plan of the mixture. Mixture stops are only used in the full organ, when they melt into the general body of sound, and are heard no longer as giving chords, but only as brightening the tone of the heavier stops of the organ, in fact, as being the upper partials of compound tones with grave primes. See ACOUSTICS.

**MIZZEN MAST**, the smallest of the three masts in a vessel, and the one placed sternmost. A rear-admiral hoists his pendant at the mizzen.

**MNEMONICS.** See MEMORY.

**MNEMOS'YNE**, or more properly **MNEMOS'UNE**, in the Greek mythology, the mother of the Muses, Zeus himself being their father, was the daughter of Ouranos. Her name is literally *Memory*, and it is evident that without the parentage of memory no progress in any art or science is possible.

**MOA** is the Maori name for certain gigantic birds which existed till, in all probability, a very recent period in New Zealand. From an examination of bones of these birds, Professor Owen showed that they belonged to the order STREPTOPHYTES, and were most nearly allied to the *APTERYX* or Kiwi, a singular little bird peculiar to New Zealand. Eleven species have now been described, the original genus *Diornis* forming the type of the family *Diornithidae*, in which the feet have three anterior toes and no posterior toe

or hallux, while the second family *Palapterygidae*, with four species, is characterized by the presence of the hallux. The moas were gigantic terrestrial birds, having the wings in an extremely rudimentary condition and quite useless for flight, and the breast-bone devoid of a keel. The largest species, *Diornis giganteus*, must have stood nearly 11 feet high, the tibia or leg-bone measuring a yard in length. *Diornis elephantopus* was a smaller bird, being about 6 feet high, but the framework of the skeleton, according to Professor Owen, is the most massive of any in the whole class of birds, and the toe-bones almost rival those of the elephant. How long the moa has been extinct is a much debated question. Not only are the bones found in an excellent state of preservation, but also portions of skin, feathers, and eggs, some of which contain remains of the embryo. The Maoris have only occupied New Zealand for some 500 years, yet they have traditions respecting the hunting of moas for the sake of their flesh and plumage; and the charred bones of the moa have been found in ancient cooking pits. It is therefore probable that these gigantic birds survived up to a very recent date.

**MO'ABITE STONE**, a remarkably inscribed stone discovered on the 10th of August, 1868, by Mr. Klein, a German missionary, near the ruins of Dibân, the ancient *Dibon*, in the land of Moab. It was a piece of basalt about 3 feet 5 inches in height by 1 foot 9 inches in breadth and thickness, and it contained an inscription written in the old Phœnician characters, and consisting of thirty-four lines of writing. When deciphered the inscription proved to be a monument of King Mesha, set up to commemorate his victories over Israel, and dating from a period 896 B.C. It was obviously desirable to obtain a memorial well-nigh 8000 years old, intimately connected with biblical history, and exhibiting nearly the whole of the Greek alphabet in the identical Phœnician shape, and others were at once made for its purchase. But the Arabs, though ignorant of the characters of the inscription, had long regarded the stone with superstitious reverence as the protector of their crops, and disputes arose as to its possession, which ended in its being broken up by them, the pieces being distributed among the chief families of the district. The energy and perseverance, however, of M. Ganneau, the French consul, and Captain Warren of the Palestine Exploration Fund, resulted in the acquisition of the various fragments, which were put together and transferred to the Louvre at Paris. A photograph of the stone has been published by the Palestine Exploration Society. See Ginsburg's "Moabite Stone" (1871); and Tristram's "Land of Moab" (1878).

**MO'ABITES**, one of the peoples of Hebrew origin, frequently mentioned in the books of the Old Testament from their connection with the Israelites. At the period when the latter were pressing into the land of Canaan the Moabites had already become settled in the rich highlands which crown the eastern chasm of the Dead Sea, a district which they had taken from a Canaanitish people referred to as the Emim. Their territories had been greatly curtailed just before this period by the Amorites; but they still occupied a position of considerable strength, and they were recognized as kinsmen by the Israelites, who made no attempt to deprive them of their land. (Judg. xi. 18, &c.) But from the story of Balaam it is evident that the Moabites regarded their new neighbours with apprehension, while the Israelites became corrupted and joined the Moabites in the licentious worship of Baal Peor. Soon after the conquest of Canaan we find the Moabites ruling over a portion of Israel, and the deliverance of the latter by Ehud is recorded Judg. iii. 14-30. A victory of Saul over them is briefly referred to 1 Sam. xiv. 47; and a further conquest, followed by a slaughter of two-thirds of the prisoners taken, by David, is mentioned in 2 Sam. viii. 2. Soon after the death of David

they appear to have regained their independence; but Omri, king of Israel, brought them again into subjection and compelled them to pay a heavy tribute, either of wool or of sheep with the wool, as mentioned 2 Kings iii. 4. This was refused after the death of Ahab, and an expedition led against them by Jehoram in alliance with Jehoshaphat, though at first successful, was ultimately compelled to retire; on account of some unexplained disaster "there came great wrath upon Israel" (2 Kings iii. 27). A period of irregular border warfare appears to have followed this campaign, and the Moabites are reckoned among the enemies of Israel when Jerusalem was taken by the Chaldeans. After the return from captivity Sanballat of Horonaim, a Moabite, took up a position of hostility to Nehemiah, and the latter at the close of his book mentions some energetic measures that he adopted to mark his displeasure with those Israelites who had married Moabitish women. By Ezekiel (chap. xxv. 8-11) the Moabites are threatened with the invasion of the children of the East; and though some centuries afterwards, in the time of Josephus, they were still a great people, they seem to have succumbed to an Arab invasion, and their memory as a separate nation has long passed away from the land they inhabited.

That at times a very bitter feeling of enmity prevailed between the Israelites and their neighbours, the Moabites, is evident from many of the incidents of Old Testament history, and from the tradition concerning their origin preserved in Genesis xix. 30 *et seq.*; but at the same time there must have been long periods when the two peoples were in a state of friendly intercourse, as when Naomi went down to dwell in the land of Moab, and when the Jews at a much later period, driven out by the King of Babylon, took refuge with the Moabites (Jer. xl. 11). From the allusions of the Old Testament also we are afforded many glimpses of the condition of the Moabites. Like the people of Israel, they recognized a national deity under whom their king was viceroy; they were the people of Chemosh, as the Israelites were the people of Jehovah (Num. xxi. 29; Judges xi. 24). Possessed of a fertile land, the people were high-spirited, wealthy, and famous for the number of their sheep and their cultivation of the vine. But they have left scarcely a trace in history, and apart from the Scriptures scarcely anything is known of their habits or customs.

**MOAK'KIBAT**, recording angels in the Mohammedan sacred legends of the Koran, who count daily the good and the bad deeds of the man whose attendants they are from the cradle to the grave, entering the good deeds ten times at sunset, but waiting seven hours before entering a bad deed, lest happily the sinner may make full repentance, and so blot it out.

**MO'ALLAKAT**, an Arabic term signifying suspended, applied by the Arabs to seven long poems in their language which have come down from pre-Mohammedan times. An old and oft-repeated tradition asserts that these poems were chosen, on account of their superior excellence, to be written in letters of gold on rolls of cloth and hung upon the walls of the Caaba. This tradition can be traced back for about 1000 years, but its falsity has been conclusively proved by modern scholars. There is every reason to believe that the poems were not written at all until about the eighth century, but until that period were transmitted orally by a class of men termed *rûwâs*, who made it their business to learn and repeat the works of the poets. The seven poems of the Moallakat are selected from the works of the poets Amrakais, Tarafa, Zohair, Labid, Antara, Amr ibn Kolthûm, and Hârih ibn Hilliza, who flourished during the sixth and the early portion of the seventh centuries. Of these poets, Labid is the only one who became a convert to Mohammedanism, and his poem was composed during the pagan period of his life. When tested by the standards of

Western taste, the poems of the Moallakat have but little poetic value, but from a historic point of view they are extremely interesting, from the glimpses they afford into Arab thought and feeling during the period of the old free desert life of that people.

**MOAT** is a broad and deep trench round the ramparts of a fortress, that may either be kept dry or filled with water. In practice it is generally dry. The depth is about 12 feet and the width 24 and upwards, sometimes even 120 feet. The rampart is generally formed of the earth taken from the moat or ditch. The more perpendicular the walls of the moat, the greater will be the obstruction offered to the enemy. In regular works the walls are lined with masonry, that below the rampart being called the *scarp*, and the opposite side the *counterscarp*.

**MOA'WIYA**, the sixth Caliph, and first of the Omayyad dynasty, was the chief of that house of Omayya which, under his father Abu Sofian, had personally opposed the Prophet himself, and more than once almost ruined his career. Moawiya became one of Mohammed's secretaries, when a hollow conversion of the Omayya to Islam took place. At the death of Othman (656), Moawiya raised Syria (his government) against Ali, the Prophet's son-in-law and legitimate successor, and against Ali's sons Hassan and Hussein, the grandsons and only descendants of the Prophet. Thus began the first civil war among the Moslems. Ayesha, Mohammed's wife, "the mother of the faithful," aided Moawiya against Ali, of whom she had always been a bitter enemy, and Ali's victory on "the Day of the Camel" was almost jeopardized by her ferocious courage in the field, when she refused to quit her camel though seventy men fell at her bridle in the fight. In the long contest that ensued 70,000 Moslems fell. Eventually by the assassination of Ali at the hand of some obscure fanatics, who also attempted unsuccessfully his own life, Moawiya, on Hassan's retirement in 661, succeeded to the caliphate, and the hereditary foe of Mohammed at last sat in Mohammed's seat. The fate of Hassan and Hussein is given in the article under that title. Moawiya reigned till 680.

**MOB**, an undisciplined or disorderly crowd; a contraction of the Latin term *mobile vulgus*, the fickle or restless commonalty. The word *mob* was first used for the lower orders by the courtiers of Charles II.

**MOBILE**, a seaport and the largest town of Alabama, in the United States, is situated on the Mobile River, immediately above its entrance into the bay of the same name, 140 miles east by north of New Orleans, and 1033 from Washington. It has an advantageous position for trade, being the natural outlet of the greatest cotton region in the south, and possessing good railway accommodation. The site is a level sandy plain, sufficiently elevated for the purpose of convenient drainage, being about 15 feet higher than the bay. The streets are wide and planted with trees. The entrance to the harbour has been much improved with the aid of Congress grants, and a breakwater was constructed in 1877. The city has the usual public buildings, a Roman Catholic cathedral, numerous churches, medical and Jesuit colleges, market-house, two hospitals, and an infirmary. The bay is 30 miles long by from 3 to 18 miles broad, protected at the entrance by Forts Morgan and Gaines, taken by the Federal squadron under Admiral Farragut in 1864. The population in 1880 was 29,132.

**MOCH'A** or **MOKHA**, a fortified town and a port, in the province of Yemen, in Arabia, is situated on the eastern shore of the Red Sea, near its mouth. The celebrated Mocha coffee is brought from the interior for shipment, and about 10,000 tons are annually exported to Jeddah, Suez, and Bombay, besides dates, gums, senna, horns, hides, balm, ivory, and gold-dust. The chief imports are rice, piece-goods, iron, hardwares, slaves, and ghee, from Abyssinia, but many of the goods are only brought to Mocha in the way of transit. The harbour is only adapted



for vessels drawing 10 or 12 feet of water. All round the shore is a hot sandy waste. The town is strongly fortified. It contains several mosques and caravanserais, and a population of about 5000.

**MOCK SUNS or PARHELIA.** See HALO.

**MOCKING BIRD** (*Mimus polyglottus*) is a well-known American bird belonging to the thrush family (Turdidæ). It inhabits a very considerable extent of both North and South America, having been traced from the states of New England to Brazil, and also among many of the adjacent islands; it is more numerous in the states south than in those north of the river Delaware, being generally migratory in the latter, and resident (at least many of them) in the former. A warm climate and low country, not far from the sea, seem most congenial to its nature; accordingly we find the species less numerous to the west than east of the great range of the Alleghany, in the same parallels of latitude.

Wilson and Audubon have both expatiated on the astonishing vocal powers of this wonderful song-bird, and the grace and elegance of its actions. The following is a portion of Wilson's description:—"The ease, elegance, and rapidity of his movements, the animation of his eye, and the intelligence he displays in listening and laying up lessons from almost every species of the feathered creation within his hearing, are really surprising, and mark the peculiarity of his genius. To these qualities we may add that of a voice full, strong, musical, and capable of almost every modulation, from the clear mellow tones of the wood-thrush to the savage scream of the bald eagle. In measure and accent he faithfully follows his originals; in force and

decoyed by the fancied calls of their mates, or dive with precipitation into the depths of thickets at the scream of what they suppose to be the sparrow-hawk."

The mocking-bird is between 9 and 10 inches in length; the plumage of the upper parts is brownish-ash colour, with the wings and tail nearly black; the lower parts are brownish-white. The mocking-bird is found principally in the woods of low districts, where it feeds upon the berries which grow in profusion on the luxuriant thickets of the swamps, and also upon insects, which it often captures on the wing with great dexterity. In winter it lives chiefly near farmhouses, and at all times displays a liking for the proximity of the human species.

The mocking-bird builds a nest of twigs, leaves, grasses, cotton, flax, &c., in the fork of a branch; the eggs, from three to six in number, are pale green, blotched and spotted with umber brown. It becomes very familiar in captivity, but its powers of song are much weakened by its loss of liberty. There are about twelve other species of the genus *Mimus*, mostly from South America, all possessing remarkable powers of song.

**MODE** (Lat. *modus*), in music, is the order of the sounds forming the different scales. [For the modes of the ancient Greek music, see the article GREEK MUSICAL SYSTEM; for the mediæval modes, see the article MODES, ECCLESIASTICAL.] *Mode*, in modern musical language, signifies the melodious arrangement or development of the scale of the octave. When all the intervals of a key (reckoned from the keynote) are major, it is said to be in the major mode, and when the Third and Sixth are minor, the key is in the minor mode. The chromatic mode contains twelve notes to the octave, each a semitone apart.

**MODEL, THE NEW**, the title given to the army of the Long Parliament after its vigorous reorganization in connection with the SELF-DENYING ORDINANCE (first passed in the Commons, 19th December, 1644). This reorganization was not achieved until after almost internecine struggles in Parliament; but the bill was finally passed for the New Model (Fairfax having been previously elected general) 19th February, 1645. Thenceforth the king had never a chance against the army of the Parliament, and the Civil War drew rapidly to a close.

**MODELLING.** Modelling in clay requires the aid of a few tools; but no tool is more useful than the finger, indeed, tools are mere aids to the fingers, designed to do what these cannot well perform. Wire tools are most useful, being fashioned into loops of various shapes and sizes, round and angular, fixed into wooden handles. The wooden tools are made of box and ebony, of various shapes and sizes—curved, straight, pointed, rounded, and flat and broad; the broad tools being notched, and designed chiefly for working the large convex masses, or large folds in drapery.

The clay used is common potter's clay, but of the finest quality. It must be so wet that it will not stand in a mass much higher than its own width without support. The supports for the clay are a most important consideration; for if not properly attended to, the finished work, the fruits of months of labour, might suddenly fall to pieces by its own weight. Sculptors generally model figures of the ordinary size upon a bench or stand called a banker, about 30 inches high and about 80 inches square—for a bust it must of course be much higher; above this a solid circular plinth is fixed on a wooden box, and is revolved upon six or more wheels, or what are better, short slightly conical rollers, fixed to the plinth near the circumference. A revolving plinth is necessary to enable the sculptor to see his work on all sides in any light, and it allows him to work on all parts in one spot or in the same light. On the centre of the plinth is built up a skeleton framework of iron and wood, projecting in various directions, to support the various parts of the figure.



Mocking Bird (*Mimus polyglottus*).

sweetness of expression he greatly improves upon them. Neither is this strain altogether imitative. His own native notes, which are easily distinguishable by such as are well acquainted with those of our various song-birds, are bold and full, and varied seemingly beyond all limits. They consist of short expressions of two, three, or at the most five or six syllables, generally interspersed with imitations, and all of them uttered with great emphasis and rapidity, and continued with undiminished ardour for half an hour or an hour at a time. His expanded wings and tail, glistening with white, and the buoyant gaiety of his action, arrests the eye, as his song most irresistibly does the ear. He sweeps round with enthusiastic ecstasy; he mounts and descends as his song swells and dies away. While thus exerting himself, a bystander destitute of sight would suppose that the whole feathered tribes had assembled together on a trial of skill, each striving to produce his utmost effect, so perfect are his imitations. He many times deceives the sportsman, and sends him in search of birds that perhaps are not within miles of him, but whose notes he exactly imitates; even birds themselves are frequently imposed on by this admirable mimic, and are



Another essential part of modelling is preserving the moisture of the clay, which should be always uniform, if possible; it must never be allowed to dry, and it can be kept moist with very little trouble. While the modeller is at work and the figure is exposed, especially in warm weather, he should repeatedly sprinkle it with water. A plasterer's brush is the best instrument for this purpose. When the model is complete the next process is to take the cast to work the marble from or to make other casts from. The ancient sculptors used to bake their models, but this is not so good a plan as making plaster casts from them, though less troublesome and much cheaper. Modelling is also practised by medallists, who model a cameo of the figure intended to be cut in intaglio with wax on a piece of slate. Wax is also employed by goldsmiths and jewellers, in designing intricate and fanciful decorations for pieces of plate. Wedgwood modelled for Flaxman, the sculptor, numerous objects in wax. Flower-modelling in wax was, in the last generation, one of the "fashionable accomplishments" of young ladies. It is even now not altogether extinct.

**MOD'ENA**, an important town of Italy, the capital of a province of the same name, and the Roman *Mutina*, is situated 59 miles north by west from Florence, in the centre of a wide plain between the Panaro and the Secchia, and had 58,058 inhabitants in 1882. The town is well built, and has several handsome churches and palaces. Most of the streets have arcades on each side. The palace of the former grand-dukes is a magnificent edifice; it contains a fine gallery of paintings by the great masters, and a valuable library of 100,000 printed volumes and 3000 MSS. The cathedral, a Gothic building of the eleventh century, is remarkable chiefly for its lofty square marble tower, one of the loftiest in Italy, in which is kept the famous bucket, once the cause of a serious feud between Modena and Bologna, and which has been immortalized by Tassoni in the "*Secchia rapita*." The other remarkable buildings are—the theatre, the college, the barracks, the hospital, and the old citadel, which is now used as a penitentiary. The University of Modena, suppressed in 1821, has been succeeded by a school of theology, law, medicine, and mathematics. Manufactures of hempen and woollen cloths, hats, glass, and leather, are carried on; the silk manufacture, once important, has declined. A canal uniting the Secchia with the Panaro affords a line of boat navigation between Modena and the Po. *Mutina* is supposed to have been founded by the Etruscans. It is said by Livy to have been colonized by the Romans, A.U.C. 569, and it is styled by Cicero "*firmissimam et splendidissimam populi Romani coloniam*" ("*Phil.*" v. 9). A few Roman antiquities, mostly tombs, still exist, and the *Emilian Way* lies through the midst of the town. It suffered many disasters in the times of Attila, Odoacer, and the Lombard kings; and was afterwards governed successively by its bishop and magistrates, and belonged to the popes, Venetians, and the dukes of Milan, Mantua, and Ferrara, before it became the property of the house of Este. The last grand-duke fled from the duchy in 1859. The learned antiquary Sigonius, the poets Molsa and Tassoni, and the celebrated anatomist Fallopius, were natives of Modena.

**MOD'ERATOR**. In the Universities of Oxford and Cambridge the moderators are certain public officers who moderate or preside in the exercises publicly performed in the schools by candidates for the degree of bachelor of arts. In Scotland the term is synonymous with the English term *chairman* or *president*—as, Moderator of the General Assembly, Moderator of the Edinburgh Presbytery, &c.

**MODES, ECCLESIASTICAL**, the system underlying the music of the middle ages. This system is best exemplified by considering the totality of musical tones in use during the middle ages, as represented by the white keys of

the pianoforte. If these be grouped into scales of eight notes each, it will be at once apparent that there are two semitones and five tones in each, but not arranged in the same position in any two scales. Taking the lowest series, from A to A,

A B C D E F G A,

we find the semitones between 2-3 and 5-6; but if we take the next series,

B C D E F G A,

we have the semitones between 1-2 and 4-5. The following series,

C D E F G A B C,

gives us the semitones between 3-4 and 7-8, and so the discrepancy continues.

The seven octaves from A, from B, from C, D, E, F, and G all differ in their arrangement, and consequently in the melody they yield as a scale, and in the harmony they would yield if harmony were rigidly limited to their eight notes. Of these seven possible varieties or *modes* of octaves St. Ambrose is held to have adopted four (those beginning on *d, e, f, and g*), and to have brought all church chants into the compass of one or other of these four (about 384). St. Gregory the Great, who became pope in 590, found that many chants had sprung up since Ambrose's time which it was impossible to bring into the Ambrosian modes. Therefore, calling these latter *authentic*, and regarding them as running from the keynote to its octave, he added to each one its *plagal* (Gr. *plagios*, athwart), which was also of one octave in length, but ran across or athwart the keynote, from dominant to dominant. The plagal of the *d* mode ran from A to a, and that of the *e* mode from A to b, &c. Gregory's four plagals ran from A, B, c, d, the "final" or keynote of each being the fourth note from the bass. Later writers added authentic scales from a and from c'; but that from b was always rejected, because the Fifth was a diminished Fifth, and the dominant consequently "impure." They also added plagal scales from e and g, with the finals or keynotes a and c', but omitted that from f, as the final b would have given an augmented Fourth from the bass note, and was consequently impure. The modes were both numbered and named, the numbering taking odd numbers for authentic and even numbers for plagal modes, and the naming being a mixing up of ancient Greek names of scales. The real Greek names depended merely upon the pitch of the keynote (*mesé*), for all their scales were in construction alike [see GREEK MUSICAL SYSTEM], and in one case, the *Dorian*, the two nomenclatures agree, but in that one case only. This confusion is most lamentable, and not until our own day has it been cleared up. Greek Dorian and ecclesiastical Dorian is the scale

D E F G A B C A (Dorian with final d),

and the Hypodorian, which is its dominant in our modern musical parlance, is, of course, also the same in both systems—

A B C D E F G A (Hypodorian with final d).

But as to the rest, they differ both in name and in nature. The Greek scales were all built on the pattern of the Dorian given above, each having the semitones in those same places, and each carrying its *hypo*- or dominant and its *hyper*- or subdominant, as in the following table. (Hyperdorian ran G A B C D E F G.)

GREEK SCALES.	
Dominant.	Subdominant.
c# Hypolydian.	f# Lydian.
c Hypæolian.	f Æolian.
B Hypophrygian.	e Phrygian.
Bb Hypoæolian.	e Ionian or Ionian.
A Hypodorian.	d Dorian.
	g Hyperdorian.

b Hyperlydian.  
bb Hyperæolian.  
a Hyperphrygian.  
ab Hyperæolian.

The list of the ecclesiastical modes, each of which differs in the arrangement of its tones and semitones, as has been fully explained, is as follows:—

# ECCLESIASTICAL MODES.

## Authentic.

I. Final or keynote	d, Dorian.
III. "	e, Phrygian.
V. "	f, Lydian.
VII. "	g, Mixolydian.
IX. "	a, Aolian.
(XI.) "	b, (Loerian.)
XIII. "	c', Ionian.

## Plagal (dominants).

II. Beginning on A, final	d, Hypodorian.
IV. " B,	e, Hypophrygian.
VI. " c,	f, Hypolydian.
VIII. " d,	g, Hypomixolydian.
X. " e,	a, Hypoaoelian.
(XII.) " f,	b, (Hypoloerian.)
XIV. " g,	c', Hypoionian.

Of these, as aforesaid, Modes xi. and xii., Loerian and Hypoloerian, were rejected. The dominant was, as with ourselves, the Fifth of the scale, in the authentic modes, except in the Phrygian (iii.), when c, not b, was the dominant, to avoid the chance of the interval b-f, a tritone. But in the plagal modes the dominant was the Sixth of the scale, except in the Hypomixolydian (viii.), which took c', and not b, for the same reason as that just given in the case of the authentic Phrygian. The *mediant* (Third of the scale in authentic modes, variable in plagals) and the *participant* are other notes of importance in each mode, chiefly serving as the points to which modulation is to be directed. To ascertain in what mode a piece of mediæval music is written take the last bass note as the final; then examine the tenor (always the part carrying the plain-song melody), and if it lie between final and final, then the piece is in an authentic mode; but if it lie between dominant and dominant, then the piece is in a plagal mode. If there is a signature of an accidental (b?), the piece has been transposed, and a correction must be made for this, the true final lying a Fourth below the apparent one.

**MODILLION**, in architecture, an ornamental member in the Corinthian cornice, resembling a small bracket placed horizontally; that is, with its back against the soffit of the part it supports, in which respect it differs from the *consol*. Modillions are placed beneath the corona of the cornice, and although sometimes omitted out of parsimony, are indispensable to the character of the order. In the Ionic order the modillion is less richly carved than in the Corinthian, and in the Doric its place is occupied by the *mutule*. See article GREEK ARCHITECTURE and the Plates illustrating it.

**MODULATION** (Lat. *modulatio*, a measuring), a term used in musical composition for a change of key during the progress of a movement. The word arises from the modulation being by change of *mode*, not by change of *key*, in the mediæval system, as the conception of keys had not yet been developed. [See MODES, ECCLESIASTICAL.] In modern music modulation may be divided into Simple, Chromatic, and Enharmonic. Simple modulation is a change from a given key to another nearly related to it, namely, to its dominant or Fifth, its subdominant or Fourth, its tonic or dominant, relative minor, &c., and this modulation, not to be abrupt, is effected by at least one intermediate chord, which must belong to the harmony of the key into which it is intended to pass. Cherubini gives as a complete course of modulation for an important fugue the following beautifully arranged scheme of keys:—Starting from the Tonic major, (1) to the dominant; (2) to the

Sixth minor (relative minor); (3) to the subdominant; (4) to the Second minor (relative minor of the subdominant); (5) to the mediant minor (relative minor of dominant); (6) to the dominant, with "pedal," &c.; (7) to the tonic again. If the piece starts from the tonic minor the order is mediant, dominant minor, Sixth, subdominant minor, Seventh, tonic minor or major. Chromatic modulation is the change from a given key to some other not so nearly analogous to it; that is, to one differing much in scale, and consequently in signature. Enharmonic modulation is the change from a given key to another quite unanalogous, by means of an enharmonic interval; as when we modulate from C to D by using D $\sharp$ , a note of the key of C, for C $\sharp$ , a note very nearly at the same pitch, but in the key of D. On the pianoforte and such instruments these notes are expressed by the same sound; and then enharmonic modulation consists only in changing the name of the note and suitably harmonizing it for its new position in the new scale.

**MODUS**, one of the time-divisions in mediæval music (*Modus major*), signified the division of the *Maxim* into two *longs* (imperfect) or into three *longs* (perfect). *Modus minor* was the term used for the division of a long into two *breves* (imperfect) or three (perfect). *Tempus* divided *breves* into *semibreves*; *Prolatio* divided *semibreves* into the least notes of all, the *minims*. *Modus* is also, of course, the Latin for *mode*, and the context must show whether an ecclesiastical mode or a time-division is meant.

**MŒSIA**, the name of a province of the Roman Empire, extending north of the range of Mount Hæmus, the mountain Balkan, as far as the Danube, and eastward to the Euxine, corresponding to the present kingdoms of Servia and Bulgaria.

**MŒSO-GOTHIC LANGUAGE**, the most easterly and ancient of the Teutonic dialects, now extinct, but preserved in the commentaries and translation of the Gospels by the Arian bishop Ulfilas, in the fourth century, for the use of the Goths whom the Emperor Valens had permitted to settle in Mœsia (376). It is a point of dispute how much German, &c., owe to Mæso-Gothic; but clearly it is closely allied to them, and very possibly is the parent of them all. In variety of inflexion, power of derivation and composition, presence of a dual, of certain passive forms, and abundance of radical words it resembles the Greek strongly; while the form of the radicals is essentially Teutonic, and they almost all still exist in German; and, also, other Teutonic features are strongly marked, such as the want of all tenses of the verb beyond present and past, the co-existence of a complete system of "strong" vowel changes with a well-marked "weak" order of inflexions, &c. The following specimens of Mæso-Gothic may serve to illustrate this article:—"Blindain managain fragaf sun" (To blind many he forth-gave seeing), Luke vii. 21; "Raus fram vinda wagid" (A rush from, or by, the wind wagged), Luke vii. 24; "Yah so bargo alla garunnana was at daura" (And the borough, all gathered, was at the door), Mark i. 88.

**MOFFAT**, a watering-place of Scotland, in the county of Dumfries, situated near the east bank of the river Annan, 20 miles north by east from Dumfries, and 2 miles from the Beattock station of the Caledonian Railway, with which it was connected by a railway in 1883. It is protected on the north-east by a screen of lofty mountains, and is a clean, pleasant, and well-built town. The air, too, is unusually pure and salubrious. There are baths, assembly-rooms, a parish, Free, United Presbyterian, and Episcopal churches, a subscription library, hydropathic establishment, an academy, and an endowed school, recreation grounds, mechanics and Oddfellows' halls, &c., and a fine fountain was erected in 1875. The sulphurous water of Moffat contains 4 cubic inches of nitrogen gas in

231 cubic inches, 5 cubic inches of carbonic acid gas, 10 cubic inches of sulphuretted hydrogen gas, and 86 grains of sulphate of soda. The chalybeate water of Hartfell, 5 or 6 miles north by east from Moffat, contains 5 cubic inches of azotic gas in 231 cubic inches, 84 grains of sulphate of soda, 12 grains of sulphate of alumina, and 15 grains of oxide of iron. The sulphurous water is found of great service in scrofula, cutaneous eruptions, and filious complaints; the chalybeate water in disorders of the stomach and bowels. The population of the parish in 1881 was 2980, of the town 2161. During the season the population is increased by a large number of visitors, for whose accommodation there are numerous fine villas.

Moffat, meaning "the foot of the moor," was created a burgh in 1635. It is mentioned as early as the eleventh century. The wells are said to have been discovered in 1659, and they began to attract numerous visitors towards the end of the eighteenth century. In Moffat House, in 1759, Macpherson began the Ossian deception. See **MACPHERSON**.

**MOFFAT, ROBERT, D.D.**, an illustrious African missionary, was born of humble parentage at Ormiston, Haddingtonshire, Scotland, 21st December, 1795. He was at first a gardener, but in 1814 he offered himself to the London Missionary Society, which in 1816 sent him to Namaqualand on the Orange River. In 1819 he married Miss Mary Smith, a remarkable woman, who proved a most helpful partner in his labours. In 1820 Moffat and his wife settled at Kuruman among the Bechuannas, and in spite of immense difficulty and danger they succeeded in winning the confidence of the natives and introducing Christianity to them. By his teaching and example the people were induced to resign their savagery, and to adopt and practise the arts of civilized life, and when after fifty years' labour as a missionary he addressed the General Assembly of the Free Church of Scotland, he was able to speak of churches and missions scattered over the whole of the Bechuana country, from the Zulus on the east to the Damaras on the west, having 40,000 communicants and 45,000 pupils. His daughter married Dr. Livingstone, and it was largely due to him that the work of that great man took the direction which it did. On his return to England in 1873, Dr. Moffat was presented with a testimonial of £5800, and he ended his days in England, dying at Leigh, near Tunbridge Wells, 9th August, 1883. See "Rivers of Water in a Dry Place" (1863, new edition, 1876); and "Faithful Labour; the Lives of Robert and Mary Moffat," by their son, John S. Moffat (London, 1885).

**MOGADORE** or **SUI'RAH**, a seaport of Morocco, situated on the Atlantic, 120 miles west of the town of that name. It occupies a sandy promontory, rising seawards into rocks, and at high water wholly inclosed. It is walled and flanked by batteries. The harbour, formed by the small island of Mogadore, is three quarters of a mile long, a quarter broad, and admits small vessels. The exports are almonds, gums, goatskins, ostrich feathers, and esparto grass. The climate is frequently recommended to those suffering from lung diseases. The population is about 20,000.

**MOGUL' EMPIRE, THE**, of Hindustan, more especially identified with the Great Mogul, the Tartar emperor of Delhi, began with Baber, the grandson of the famous Timur (Tamerlane). The word *Mogul* is the Arabic and Persian form of the word *Mongol*, and the Moguls were simply Mongols; but as the Hindustan emperors are always called by the Persian and not the Tartar name, it is better to mention them in an article under the familiar heading. Timur had taken Delhi in 1398, but this was only one among the terrible raids with which he cursed mankind. It was his great-grandson **BABER** who in 1526, after a seven years' contest, succeeded in firmly establishing the Mogul or Tartar Empire of Hindustan from the Indus

to the delta of the Ganges, with the capital at Delhi. His son, Humayun (1530-40 and 1555-56), could with difficulty govern what his father had won, and was deposed for the greater part of his nominal reign. But **AKBAR** (or Akher), son of Humayun, was a prince of remarkable sagacity and power of administration. During all his long reign (1556-1605) he was occupied in incessant small wars—resulting, however, in the consolidation of a really important power, which lasted, though of course not in the full splendour of Akbar's rule, for two centuries. Akbar was a devout Mohammedan, but wonderfully tolerant. His memory is revered almost as much by Hindus as by Mohammedans in India; and it was this magnanimity which enabled him to establish on secure bases the great Mogul Empire. Akbar was succeeded in 1605 by his son Jehangir, and the latter, in 1627, by his son **SHAH JEHAN**. This prince was a magnificent builder. The most glorious monuments of his reign are the splendid great mosque of Delhi and the unrivalled **TAJ MAHAL**, mausoleum near Agra, which cost not less than the value of £5,000,000 sterling of our money. His son **AURUNG-ZEBE** (or Aurangzib), as great a warrior as his father was a builder, took advantage of a civil war which broke out during an illness of the emperor to advance from his province of the Deccan, defeat his brothers, and depose Shah Jehan (1658). He treated him with great kindness, however. Aurungzebe was far from possessing the toleration of his great-grandfather Akbar, and as a result the native Brahman princes massed together under the title of Marhattas, with their capital at Poona, and kept even the mighty Aurungzebe in continual alarm. The successors of Aurungzebe were inferior in military prowess, while the Marhattas, on the other hand, increased yearly in effective force. The contest for supremacy between the Hindu and Mohammedan powers was already inclining to the former, when in 1738 the Persian Shah **NADIR** burst like a thunderbolt upon India, then ruled by Mohammed Shah as Great Mogul (1719-1748), sacked Delhi, ruined the empire, and carried off all available booty. After this crushing blow no less than six Afghan invasions poured over the wretched land. Cabul was lost in 1738, the Punjab in 1752. The Marhatta princes profited by the misery of India, and when Alamgir, the last of the Great Moguls, was murdered by his vizir in 1759, they seized upon the empire; but in 1761 the Afghan leader, Ahmed Shah, routed the Marhatta forces in the battle of Panipat.

As mere puppets of the English the Mogul emperors of Delhi were now set up and maintained. Bengal and other provinces came to us by a Mogul grant in 1765, and the emperors ruled under more and more restricted circumstances, till in 1827 they were merely pensioners, and their authority only reached to the great inclosure styled the palace at Delhi. In the mutiny of 1857 the last of the Moguls, Mohammed Bahadur, joined the rebels. After a short siege the palace fell, and the emperor was sent quietly to end his days at Rangoon, where he died in honourable captivity in 1862.

**MOGULS.** See **MONGOLS**.

**MOHAMMED** or **MAHOMET**, the founder of Islam, was born about the year 570 at Mecca. He came of a side branch of the powerful tribes of the Korais, but his family, though old and honourable, were at the time of his birth in somewhat reduced circumstances. His father Abdallah, a poor merchant, did not live to see the birth of his son, and was only able to leave him as a portion five camels and a female slave. During his infancy Mohammed was intrusted to a Bedouin foster-mother, who nurtured him until he reached his third year with her tribe in the desert. When he was six years old he lost his mother Amina, and fell to the care of his paternal grandfather Abd-al-Mottalib, who treated him with kindness, and when two years later the grandfather was dying he commended

his charge to Abu Talib his son, Mohammed's eldest paternal uncle. By this uncle he was brought up as a member of his family, but as the family was a poor one Mohammed had to share in its labours, and he seems to have spent some years as a shepherd in the surrounding desert. Many stories have been preserved by the Arabs concerning his early life, but most of them are obviously legendary, and we know nothing certain until we reach the age of twenty-five, when, on the recommendation of his uncle, he was taken into the service of a rich trading widow named Khadijah. In her service he made several commercial journeys into parts of Palestine and Syria, and by his fidelity and the graces of his person made such an impression upon her heart, that she bestowed upon him her hand and fortune. She was forty years old, and about fifteen years his senior, but she preserved more comeliness and vigour than most Oriental women at that age, and their union was blessed with two sons and six daughters. Both sons died young, but one of his daughters by Khadijah, Fatima, who married her cousin Ali, is celebrated in Mohammedan history. Mohammed appears to have continued to exercise his avocation as a merchant in a manner that commanded the approval of his neighbours, from whom he received the title of El Amin, "the trusty," and he was always recognized as being a meditative thoughtful man. His prophetic visions first appeared when he had reached his fortieth year, but before we can enter upon this portion of his career it will be necessary to consider the condition of the Arabs at this period.

Of a kindred race to the Jews, but placed in a rugged desert country, they had practised from a remote period nomad and pastoral habits, and had developed a type of character in harmony with their surroundings. They were active, frugal, brave, and adventurous, generous and hospitable to strangers, strongly imbued with the spirit of freedom and independence, and possessed of some high notions of personal and family honour. But their vices were as prominent as their virtues, and they were not only quarrelsome, cruel, and revengeful, but they were addicted to wine, gambling, and indulgence in sensuality. By constant family quarrels and blood feuds they were rendered incapable of union among themselves, and at the best of times the different tribes remained in a condition of armed neutrality in regard to each other. So far as religion was concerned they were in a very debased condition, and they were almost wholly given up to idolatry and fetishism. They recognized one supreme deity, Allah, but treated him with very scanty respect, and they had a vast number of lesser divinities whom they worshipped chiefly as tribal or family protectors. Their most sacred temple was the Kaaba (or Caaba) at Mecca, mentioned by Diodorus as an old sanctuary at his time, or just before the Christian era, and here they had collected all the different idols of the various tribes, some 360 in number, the chief object of reverence being a fetish consisting of a black stone concerning which certain wondrous legends were preserved. To this place the Arabs were accustomed to make pilgrimages during certain sacred months in which a truce from all warfare was observed, and the gathering for worship was also utilized for commercial purposes, until Mecca became a fair for all the surrounding country. At the time of Mohammed trade was a more important feature than worship, for the gods had fallen into disrepute, many of the Arabs being practically atheists, indifferent to the idolatry and at no trouble to find any substitute. But at the same time there were others who were moved by religious impulses, and who, while they rejected idolatry, yet earnestly sought for a higher religion. At this period the Jews were fairly numerous throughout Arabia, and though they were as exclusive there as elsewhere, their peculiar religious ideas, laws, and observances were to a certain extent familiar to their Arab neighbours. The

latter possessed also a limited acquaintance with Christianity, but hardly with Christianity as we now understand the term. The various sects which then pervaded the East, divided into Homocousions and Homocousions, Monothelites and Monophysites, Jacobites and Eutychians, had little in common but the name of Christians and the cordial hatred with which they regarded each other. Still some of the ideas current among the Christians were known to the Arabs, and we find that a sect had arisen among them consisting of men who rejected all gods save the one supreme deity, who believed in a future life and judgment, and who, in emulation of the Christian hermits and monks, sought by ascetic practices to reach a higher life. These men were known among their countrymen as Hanifa, and Mohammed, who came into connection with them through his cousin Waraka, one of their number, appears to have been an eager convert, and to have devoted much of his time to solitary meditation, fasting, and prayer. Following the example of a Hanif named Zaid, he made it a practice to spend a certain portion of each year in a cave of Mount Hira, and here, when he had reached his fortieth year, he had a vision in which he received a message from God through Gabriel, which is found at the beginning of the ninety-sixth sura of the Koran. This vision is said to have caused him much distress of mind, and he returned to Khadijah with a fear that he had become possessed, and by her he was soothed and comforted, and encouraged to await fresh visions. After a period of much anxiety and excitement, fresh visions came, and he felt that he had been called to become a prophet of God, and was intrusted with a mission to bring a pure religion to the world. Of his sincerity at this period there is absolutely no reason to doubt. Prolonged meditation and asceticism have in all ages of the world been fruitful in visions and dreams, while Mohammed was rendered peculiarly liable to such hallucinations by the circumstance that from his childhood he had suffered from a nervous disease which by modern physicians has been considered to have been either epilepsy, catalepsy, or hysteria. He found the first believer in his claims in his wife Khadijah, and his love for her in consequence grew to such a height of affectionate reverence that after her death he placed her among the only four perfect women the world ever saw. His next converts were the inmates of his household, his slave Zaid, and his most intimate friend Abu Bekr, a man of great probity and prudence, who possessed considerable influence in Mecca. The last won for him several more converts, and soon a little community was formed, the members of which united in the practice of prayer and the acceptance of the messages through Mohammed. The progress of the new sect, however, was very slow at the outset, and in the first three years it secured only fourteen proselytes, and an attempt made by Mohammed to gain the support of the Hashimites, the family to which he belonged, procured for him only the adherence of his cousin Ali, a lad of sixteen, the remainder being moved only to ridicule. But the matter had now become public, and Mohammed, undaunted by his failure, began to preach openly to his townsmen his new revelations. His first appeals were directed against the folly of idolatry, and in favour of the recognition of the one all supreme God, who required of man submission and loyal obedience; but the irreligious Meccans, who set him down to be an enthusiast, a poet, or simply a man possessed, replied to his fervent appeals with sarcasm, mockery, and open ridicule. In reply Mohammed reminded them of the way in which former prophets had been received, threatened them with destruction in this life and terrible punishment in the next, and meeting taunt with taunt he ridiculed the idols of the Kaaba in the most outspoken manner. As they did not believe in him, they only laughed at his threats; but his attacks upon idolatry appealed to their self-interest, and as they derived much

profit from their position as guardians of the Kaaba, they waited upon Abu Talib, Mohammed's guardian and the head of the family, and urged him either to impose silence upon his nephew or to withdraw his protection. This Abu Talib refused to do, but he sent for Mohammed privately, told him what had passed, and urged him for the sake of the family to desist. This appeal, coming from one who had so long befriended him, was harder to resist than the hostility or scorn of strangers, but Mohammed replied, "Though they gave me the sun in my right hand and the moon in my left to bring me back from my undertaking, yet would I not pause," and then burst into tears and turned to leave. On this the good Abu Talib called him back, and assured him that he should not be abandoned by his family. While, however, this protection saved him from open violence, it could not avail to protect his followers, some of whom were so hardly treated that they were advised by the Prophet to emigrate to Abyssinia, and at one period over 100 of them, mostly young men, had found protection there. Still he gained converts, and in the sixth year of the call he was joined by his uncle, Hamza, a man of wealth and influence, and by Omar, a warrior of great strength, strong will, and resolute courage, whose influence on the Prophet and upon Islam was of the most marked character. Further, he gained converts outside Mecca, and though he nearly lost his life in an attempt to gain the people of Taif, he received the adhesion of the people of Yathreb, afterwards called Medina, who had been impressed by his teaching when on their pilgrimages to the Kaaba. In the midst of these labours he lost his wife Khadijah, and her death was soon afterwards followed by that of his uncle Abu Talib, these events being followed by increasing hostility on the part of the Koraish. At last matters reached a crisis. A plot was formed for the assassination of the Prophet and the suppression of his party, so that early in 622 A.D. he commanded his followers to emigrate to Medina, and the same year followed them himself. It is said that the front of his house was watched by a number of men who had leagued together to join in his assassination, but that the Prophet, with Abu Bekr, escaped by the back, while Ali lay upon the bed covered with the green robe of Mohammed, so as to deceive his would-be murderers. When the Koraish discovered the deception they respected the friendship which had dictated it, and permitted Ali to join Mohammed unmolested. For three days the Prophet and his companion lay hid in a cave in the neighbourhood, and when the heat of the pursuit had subsided they resumed their journey and arrived safely at Medina. The whole of the Mohammedan world dates its chronology from this flight, or *Hegira* (Hedschra), the year 1 of the Mohammedan era being the 622nd year *Anno Domini*, and the fifty-third of the Prophet's life.

The people of Medina at this period were divided into two intensely hostile clans, whose feuds had been a constant source of disquiet; but the arrival of Mohammed secured peace by the union of these parties in the common cause of Islam. Very soon the Prophet was placed in the position of supreme arbitrator in all matters of dispute, and by the wisdom of his decisions he greatly strengthened his hold upon the people. His short creed, "There is no God but Allah, and Mohammed is his prophet," was readily accepted, and the duties of regular prayer and systematic almsgiving were enforced in a way that made open dissent very dangerous. All true believers were enjoined to regard each other as brethren, and all tribal and blood relationships were to be laid aside in the interests of the common cause of Islam. Soon the neighbouring Arabs saw a new community formed in their midst, which they were compelled to regard with wonder, not unmixed with alarm. Nor was the alarm unfounded, for as soon as the Prophet had consolidated his power at

Medina, he directed his followers to commence a holy war against idolaters, and in 628 he ordered them to attack and plunder a caravan of the Koraish on its way to Mecca during the sacred month of truce. A similar attempt, made later in the year, resulted in the battle of Bedr, in which Mohammed gained a great victory over the people of Mecca. This enabled him to break up the power of the Jews at Medina, whom he had tried in vain to conciliate, and who had manifested considerable hostility to his claims. Some of these were banished, with the confiscation of their property, and others were assassinated, so that the remainder were obliged to appeal to the clemency of the Prophet, and to desist from all open opposition. In the third year of the Hegira the Moslems were defeated by the Meccans at the battle of Ohod, in which Mohammed himself was wounded. In the fifth year he was unsuccessfully besieged in Medina by an army made up of the united tribes of Koraish, Sulaim, and Ghatafan, amounting to 10,000 men; and after this army had retired without effecting anything, he took vengeance on the Jews who had assisted them, and ordered all the men, 600 or 700 in number, to be beheaded in the market-place, the women and children being sold into slavery. One woman, after being compelled to become a convert, the Prophet took to wife. The following year he made an attempt, at the head of 1500 men, to make a pilgrimage to Mecca, and though prevented by the Koraish, the latter offered to sign a truce for ten years, and permit him to come the next year unmolested if he would withdraw till then. Mohammed accepted the conditions, and after signing the treaty led his followers back to Medina. By the terms of this agreement he was left free to send his missionaries everywhere, and the number of his adherents increased daily. Moreover, he was not compelled by the treaty to keep the peace with the Jews, and in A.H. 7 he led an expedition against the rich families occupying the cities of Khaibar and Fadak, both of which, after a short siege, surrendered. He spared the lives of most of the prisoners, but stripped them of all their property, dividing four-fifths among his followers and reserving one-fifth for himself. The prince of the Jews was put to death for concealing his family jewels, his wife, a woman celebrated for her beauty, being added to the harem of the Prophet. Another Jewess at this period attempted to poison him with a piece of meat she had roasted; and though the attempt, for which she was put to death, was unsuccessful, Mohammed believed that ever afterwards he suffered from the effects of the poison. During this year he sent messengers to several of the neighbouring kings and chieftains, demanding their adhesion to Islam, and one of these envoys being beheaded by Amru the Ghassanide, an army was sent against him, which, however, was entirely defeated. In spite of this defeat his power continued to increase, and before the truce with Mecca had lasted two years, he was able to set out against that city at the head of 10,000 men. In addition he had secured friends within its walls, so that it fell into his hands almost without resistance, A.H. 8 (680 A.D.) Here he carefully avoided bloodshed, and though he purified the Kaaba of its idols, all of which were destroyed together with the household images, he made it the centre of his religion, and forbade any but his followers to worship there. After the capture of Mecca his ascendancy was quickly recognized throughout Arabia, and the various chiefs hastened to enlist under his banner and swear fealty to his cause. The year following this event is known in Moslem chronology as the "year of embassies," from the numerous ambassadors despatched by the Arabian tribes to acknowledge his authority and to embrace Islam. All who submitted were required to accept the Moslem law, which was introduced by qualified delegates from Medina, to abandon idolatry and profess faith in Allah and his prophet, to perform the five daily prayers,

and to pay the alms tax to his appointed officers. In return the new members became united to a strong and growing confederation, they saved themselves from conversion at the point of the sword, and they became participants in the booty gained in the wars against unbelievers. In the ninth year A.H., having heard that the Emperor Heraklios was preparing a vast force to attack the Muslims, he set out to meet him at the head of 30,000 men; but there was no truth in the report, and the expedition got no further than Tabuk, on the borders of the ancient Edom. In the year A.H. 10 he performed a grand triumphal pilgrimage to Mecca, where he solemnly went through the prescribed ceremonies, and frequently preached to the people, urging them to be faithful to what he had taught them. On his return to Medina he busied himself with the preparation of an expedition against Syria, but in the midst of these labours he found death was at hand. As long as his sickness permitted he continued to take part in the public prayers in the mosque, and on one or two occasions fervently addressed the congregation assembled. Towards the end his mind wandered a little. He died about noon on the 12th of the third month, in the year 11 of the Hegira, or on 8th June, 632 A.D.

With regard to his personal appearance he is described by his contemporaries as being of middle height, rather lean, but broad-shouldered and physically strong; he had for an Arab a fair skin, but his bushy hair, long beard, and eyebrows were coal black in colour; his nose was large and slightly bent; his eyes bright and piercing, and his countenance pleasant and prepossessing. He was a man of an extremely nervous temperament, always walked "as if descending a mountain," was liable to sudden blazes of anger, during which a vein on his temple would swell up and look black, and though courageous in the face of opposition and danger, he had a great dread of physical pain. Like most of his countrymen he was passionately fond of perfumes. In his habits he was abstemious and frugal, and to the end of his life he maintained the original simplicity and poverty of his establishment. Although during the closing years of his life he had abundant wealth at his command, he was content to use it for national and charitable purposes, and continued to mend his shoes and patch his clothes as he had done in the days of his youth. To the last also he maintained the habits of fasting and prayer with which he had commenced his prophetic career. In one respect, however, he certainly used his position as a prophet to minister to his sensuality, and though he limited his followers to four wives, he claimed and practised unrestricted license for himself. During the life of Khadijah he remained content with one wife; but two months after her death he married Sanda, a widow; soon after his arrival at Medina he married also Ayesha, the daughter of his friend Abu Bekr, and he added from time to time to their number, so that at his death he left nine wives and a concubine named Mary who had borne him a son.

With respect to the character of Mohammed many different estimates have been formed by European historians. The earlier writers, starting from the assumption that he was a conscious impostor, and possibly the anti-christ of the New Testament, seek to blacken his character in every way, and refer to him as a "wicked impostor," "dastardly liar," "devil incarnate," &c. Sale, in his introduction to the Koran, departed from the custom of his predecessors and ventured to describe Mohammed as being, considering his training and surroundings, "a man of at least tolerable morals, and not such a monster of wickedness as he is usually represented." Voltaire and Gibbon, while they had no belief in his sincerity, did justice to his great powers as a leader and founder of a religion; but it was left for Carlyle to represent him as essentially great and heroic, a man of lofty aims, and a great teacher of

religion. In more recent years the life of Mohammed and the work he accomplished have been made the subject of careful investigations by modern scholars, who have each gone direct to the original sources of information, and by their labours we are now enabled to form a clearer picture of the man, of his environment, and methods of working, than was possible before. It is now universally admitted that when he commenced his career he was a sincere believer in his own call and mission, and the first-written suras of the Koran are just such fervid rhetorical passages as we should expect under the circumstances in which they were conceived. That to the end he remained convinced of the grandeur and necessity of the essential points of his teaching is also certain, but many scholars still refuse to believe that he was consciously sincere throughout his career. The results of his own deliberations, the counsels of his advisers, all sorts of regulations, permanent and temporary, matters having merely local and personal reference, &c., are set down as the revelation of God and portions of his prophetic message. At the outset of his career he was content to preach and to endeavour to persuade, but when his message was despised he vehemently cursed and threatened. In the 111th sura of the Koran one of his curses, directed against his uncle, Abu Lahab, who was one of his earliest opponents, is preserved, and in several of the earlier suras he threatens those who disbelieve with the terrible pains of hell fire. The same spirit, under other circumstances, led him to use the sword as the most ready means of effecting conversion, and that he could be cruel and revengeful the execution of the 600 Jews at Medina is sufficient evidence. At the same time he could pardon freely and generously. Many critics have compared him with some of the fiery heroes of the Old Testament. In him men of unbiassed minds are compelled to recognize a truly great man, and a religious and political reformer of vast aims and lofty aspirations; while to a large and possibly increasing number he is much more than this, and ranks among the seers whose divine messages have blessed mankind. The fanatical can only see in him either the chosen prophet of God, or the chief of impostors, according to the bent of their fanaticism.

For an account of the KORAN see under that heading; a consideration of the Mohammedan system will be found under MOHAMMEDANISM. See also Sir W. Muir's "Mahomet" (London, second edition, 1877); Sprenger's "Mohammed" (Berlin, 1861-65); Ameer Ali's "Mohammed" (London, 1878); the lectures at the Royal Institution in 1874 by R. B. Smith on "Mohammed and Mohammedanism" (new edition, 1877); and "Mahomet and Islam," by Sir W. Muir, published in 1884.

**MOHAMMEDAN ARCHITECTURE.** The purest development of this style is in the beautiful MOORISH ARCHITECTURE; but in general the necessities of the service of the mosque, calling for a large central hall, suggest a domed and pillared structure. In India the mosques have rarely hemispherical domes, as in European Turkey, but bulbous structures, some larger than the dome of St. Paul's, overswell their bases, which are ornamented by battlements on a circular or on a square ground-plan. The great gate is usually flanked by walls pierced with arches, and is itself contained by a considerable projecting, tower-like structure. The gateway rises within this tower to a great height, and terminates in a Moorish arch, or keel arch. This gate gives access to an arcaded court, reminding one of monkish cloisters, but with a vast difference at the same time, and on the further side of the court the sanctuary is situated.

In Europe the Ottoman Turks found the already existing Byzantine architecture so much to their taste and so suited to their needs, as well as providing them with materials in plenty whenever they chose to indulge their pleasure of demolition, that the hemispherical dome, the

flat outer walls with small windows, the bald and plain exterior, the richly-pillared and large open spaces of the interior, in the mosques of Constantinople, would irresistibly recall the basilican type were it not for the gay colouring and the decorative use of Arabic inscriptions, and for the absence of sculpture and, indeed, of all imitative natural forms. The slender minarets are, of course, indispensable and highly characteristic features of the Mohammedan styles. The ornamentation is based principally on the decoration of flat surfaces, and though straight lines are freely used in the arabesque designs for tiling or painting, they are never employed at right angles, while the curves also used are in like manner never allowed to form closed spaces nor to suggest the circle or any other definite curved figure. The whole feeling of Mohammedan architecture and decoration tends, in fact, to the avoidance of definite and rigid designs; flowing constructions, capricious and ingenious inventions, and brilliant contrasts of form and colour (as in the stalactite vaulting of the Alhambra, &c.) are its ideals. While versatility is thus attained, solidity and unity of design are too often sacrificed.

As for any secular style (except in some of the ancient palaces of India, which copy the mosque-style), Mohammedans have none. Their palaces and buildings of the present day are hideous copies of the worst Western styles. And yet there were finely characteristic old Mamluk houses in Cairo, with wooden lattices, which offered the first material for a native architecture. As a part of the general Ottoman stagnation these models have been allowed to pass neglected, and they are now being plundered for the benefit of more appreciative Western purchasers, who carry them off piecemeal.

**MOHAMMEDANISM.** In the article MOHAMMED we have described the union which was effected among the Arab tribes by the Prophet, and the impulse which the new faith, aided by fanaticism and the love of plunder, gave to the spirit of conquest among them. The death of the Prophet seemed for a short time to threaten the break up of Islam, and the first work that Abu Bekr, his immediate successor, had to undertake was the bringing back to their allegiance a number of the tribes who had revolted. In this he was soon successful, his armies everywhere overcame the resistance offered, and those who refused to submit and return to Islam were put to death without mercy. The conquerors were thus enabled to turn their arms against the surrounding countries, their expeditions being attended with the most wonderful success. The caliphate of Abu Bekr lasted only two years and one month, and on his death the warrior Omar was elected his successor. Omar was a man of immense courage, strong will, and clear insight, and his influence over the Moslem cause was very great. Remaining at Medina as an organizer of victory his generals rapidly completed the conquest of Arabia, overran and occupied Syria, Mesopotamia, Assyria, and Babylonia. Egypt was subjugated in 641, and in the same year the Persian power was broken in a decisive battle, the Sassanid Empire falling soon afterwards piecemeal into the hands of the Moslems. These conquests were facilitated by the fact that both the Byzantine and Persian empires were at this period in a very distracted condition. The Persian power had been greatly reduced by the victories of Hērakleios, and though the resistance of the Persians was intensified by their pride of race and religion, their power proved quite unequal to stem the tide of Arab fanaticism and valour. The provinces of the Byzantine Empire also outside of Asia Minor, with Egypt, were in a state of chronic discontent, and though nominally Christian, the people were fierce sectaries disunited among themselves, and only at one in their dislike of the domination of the Greek Church and emperor. Hence there was little national resistance to the Arabs, and when the regular armies had been defeated, the population readily adapted

themselves to their new conditions. Idolatry only was marked out for destruction by the Arabs, and Christians and Jews were allowed to retain their respective religions, upon the payment of a poll tax graduated according to their means, and were confirmed in the possession of their lands, though they had to pay a rent to the state varying in its extent according to the character and fertility of the soil. In addition it must be remembered that the Arabs had for many generations been a warlike people, skilled in the use of weapons, and eager for renown as warriors. At the time of Mohammed they had learned to fight as infantry, as cavalry, and mounted on camels. For defensive arms they wore the helmet and coat of mail with a cuirass of leather covered with plates of metal, and all ranks were skilled in the use of the shield. The infantry were armed with spears and swords, and many of them were also expert bowmen; the cavalry fought chiefly with the lance. So long as they had remained the prey of internecine warfare among themselves, they had been no menace to their neighbours, but now, united in a common faith and common brotherhood, they proved most formidable adversaries. Previous to the time of Omar the tribes had devoted a portion of their time to the care of their cattle and the cultivation of the soil, and had made war in their intervals of leisure, a state of things resembling that which existed in Syria at the period referred to in 2 Sam. xi. 1, where we read, "And it came to pass at the return of the year, at the time when kings go out to battle," but by Omar arrangements were made for the maintenance of standing armies. This step he was enabled to take by the vast revenues which were poured into the coffers of the Moslem exchequer from the poll and land taxes paid by the Christians and Jews, the alms tax, paid by Moslems, and the fifth share of all the plunder taken in war, which was set apart as the portion of the caliph. During the early years of the caliphate, the proceeds of the plunder taken were so immense that the whole Arab nation was subsidized, and as the warriors returned laden with spoil and attended by captured slaves, their comrades who had remained at home were fired with ambition to gain similar prizes, and eagerly took up arms to join in the wars. In spite of their habits of irreligion also, the vast success of the new faith must have made an immense impression upon them, and as the delights of Paradise were assured to every true believer who died in battle against the infidel, they fought with a reckless courage that spread terror in the hearts of their opponents. The old histories are filled with stories of the fierce death-defying valour of the Arabs in their onslaughts, and some striking illustrations of the survival of the old spirit were afforded by the Soudanese in the war of 1888-85. Arab writers claim that at the death of Omar the armies of the faithful had reduced to his obedience 86,000 cities and fortified places, had destroyed 4000 places of worship used by unbelievers, and had built 1400 mosques for the service of the Mohammedan religion. Sir W. Muir estimates that before the death of Omar, about 500,000 Arabs had moved out of Arabia and had become settlers in the conquered territory. Omar I. was succeeded by Othman, whose caliphate was signalized by the breaking out of internal dissension and dynastic quarrels which were never afterwards wholly healed, and which led to his being murdered by his subjects in the year 656. By these dissensions and the wars to which they led, the action of the armies of Islam was to some extent impeded, but the tide of conquest never turned until the whole of Asia from the Indus to the Mediterranean, Egypt, Northern Africa, and Spain, recognized the authority of the Moslems. At the close of the first century after the death of Mohammed, the Arabian Empire extended 200 days' journey, from the confines of India and Tartary to the western coasts of Africa, and "the language and laws of the Koran were studied with equal devotion at Samarkand and Seville, the Moor and the Indian embraced as



countrymen and brothers in the pilgrimage of Mecca, and the Arabian language was adopted as the popular idiom in all the provinces to the westward of the Tigris."

The seat of the caliph was first at Mecca, then as the old home of Arabia became a subsidiary district to the newly acquired territory, it was moved to Damascus, to Kufa, and finally a new city was built for it, and in 762 Almanсур the Abbaside (see *ABBASIDES*) established it at Bagdad. It was here that the Mohammedan Empire reached its apogee during the reign of HAROUN AL RASCHID, which began in 786. Early in the next century the establishment of separate kingdoms nominally acknowledging the Caliph of Bagdad began, the history of which becomes merged in that of the countries they incorporated. As we have already mentioned under MOHAMMED, the Arabs previous to the rise of the Prophet were an illiterate and uncultivated people, but with the progress of their empire fresh needs became manifest, and they were compelled to turn their attention to learning. As the Koran formed the foundation of their religion a knowledge of writing became necessary, and grammar and lexicography had to be studied. Soon their national poems were committed to writing, compared with each other, amended and criticised. Their laws also were based upon the same sacred book, and schools of jurisprudence arose by which codes were drawn up and explained. Soon too they felt the necessity for a written record of the acts and words of the Prophet, his first followers and contemporaries, the conquests made by him and by his successors, &c., and biography and history came into favour. Theology from the outset was a necessary study, and as the Koran from the very first contained within itself abundant germs of discord, those who endeavoured to expound it were soon engaged in fierce polemic with each other. Then as the conquerors extended the circle of their influence they came into contact with the learning of the Western nations, and they quickly displayed wonderful powers of assimilation. The Abbasides are justly celebrated for the encouragement they gave to learning, and it was during their dominion that the works of Aristotle, Ptolemy, Euclid, Plato, Hippocrates, &c., were translated into Arabic, and the way prepared for those illustrious Mohammedan scholars whose works served to enlighten Europe after the darkness of the middle ages. By degrees an elaborate system of administration was formed, and proper officials were appointed for the management of the affairs of state, the regulation of the different provinces, the administration of justice, and the maintenance of the observances of religion. During the greater part of the first century of Mohammedan history the Arabs were obliged to intrust all their book-keeping to Christians and Persians, and their accounts were kept in the Greek or Persian languages, but the Caliph Abd-al-Melik (685-705) substituted Moslems for all the Christian and Persian clerks in the government offices, and ordered that in future all accounts should be kept in Arabic. It was during the reign of this caliph also that the Arabs instituted a special coinage of their own.

This rapid development in territorial aggrandizement and political organization was attended by an equally marvellous growth of theoretical and practical theology; *Iman*, faith, and *Da*, practice. The primitive and universally accepted confession of faith, "There is no god but the true God, and Mohammed is his prophet," was by the Mohammedan doctors at an early period subdivided into six branches—(1) belief in God; (2) in his angels; (3) in his scriptures; (4) in his prophets; (5) in the resurrection and day of judgment; and (6) in God's absolute decree and predetermination both of good and evil. Four chief points were specified in relation to practice: (1) prayer, with the necessary washings and purifications; (2) alms; (3) fasting; and (4) the pilgrimage to Mecca. That these beliefs and practices are the essentials of the Mohammedan system of religion is still

universally admitted by Mohammedans, but like Christians they have split into an immense number of sects. Of these our are admitted by each other, to be orthodox, but the orthodox regard all the rest as heretical. The differences between the four orthodox sects relate chiefly to matters of jurisprudence, but these are important inasmuch as the law in question is accepted as sacred and divine. In the early days of Mohammedanism many questions came up for decision before the caliphs for which no direct command could be found in the Koran, and the decisions had to be given either in accordance with some traditional remembrance of the Prophet, or were based upon analogical reasoning. These traditions were for a long time preserved only in the memories of the Arabs who had been companions of the Prophet and those to whom they had been orally communicated; but by the beginning of the second century of the Hegira the necessity for fixing the tradition in writing had become apparent, and the Imam Malik ibn Anas (713-795), a native of Medina, undertook the task. He collected with much industry an immense number of these floating traditions, and rejecting all he regarded as doubtful, he selected about 1700, which he arranged in the order of their subjects, and entitled the whole collection *Mowatta* or the "Beaten Path." This treatise soon came to be regarded as second in value only to the Koran itself, and it is upon this treatise that the great orthodox sect of the *Malekites* take their stand. At Irak another school of law was founded, the leaders of which, proceeding by a different method, endeavoured to establish a complete system of moral and civil law by a process of reasoning applied to the Koran. The most distinguished member of this school was the Imam Abu Hanifa (699-767), the founder of the sect of the *Hanifites*. This is the most widely spread of the orthodox sects, and it is to this that most of the Ottomans belong. The Hanifites are termed by the Mohammedans the "followers of reason," on account of the slight value they place upon the reputed traditions of Mohammed. The third great orthodox sect of the *Shafites* owes its origin to the Imam As-Shafi of Bagdad (767-820), who took up an intermediate position between the schools of the Malekites and Hanifites, and endeavoured to hold an equal balance between the methods they employed. The last of the four orthodox Imams was Ahmad ibn Hanbal, a pupil of As-Shafi, a man of puritanical tendencies, who compiled a legal system chiefly from the traditions, in which he attempted to lead men back to the primitive simplicity of the faith. The sect he founded was never numerous, and his system is now almost entirely obsolete. Of the heretical sects of Mohammedanism it is impossible to give any notice within the limits of this article. They are extremely numerous, and Mohammedan writers reckon up seventy-three, in order to agree with the number which Mohammed is said to have foretold. Nearly every phase of religious thought and feeling has found a place within the Mohammedan system, and has been taught either openly or secretly by its adherents. A word, however, must be said concerning the great division by which the Mohammedan world is separated into two hostile parties, who regard each other with more enmity and dislike than they feel towards those regarded as unbelievers. After the murder of the Caliph Othman, to which we have already referred, two caliphs were elected, one MOAWIYA, the cousin of Othman, and the other Ali, the friend and companion of the Prophet. There is some reason to believe that Mohammed designed to nominate the latter as his successor, and it is said that steps were taken by Omar to prevent this, but the point is very uncertain, and as we have seen three caliphs were elected in succession to the Prophet to the exclusion of Ali. In the war which raged between Moawiya and Ali the latter was not very successful, but he maintained much of his authority and power up to his assassination in A.H. 40 (660-1 A.D.) He left two sons, but the elder;



Hassan, resigned the caliphate and was afterwards poisoned, and the younger son, Hussein, was killed by the orders of the Caliph Yazid (680 A.D.). The party of Ali, however, which had come to regard him as almost equal to Mohammed himself, was not destroyed by these murders, and it maintained its existence until the caliphate of Mothi Lilla the Abbaside, and then as the *Shiah* party it split off and became an independent influence in the Mohammedan world. *Shiah* is a nickname, meaning "sectaries," given by the orthodox *Sunites*, the Shiites calling themselves by the name of Al-Adeliat, or "sect of the just ones." They reject the authority of the first three caliphs, whom they declare to be usurpers, and they pay no respect to the Sunna or collection of traditions which the orthodox Mohammedans accept as being of canonical authority. Like the Sunites the Shiites are subdivided into an immense number of sects, some of which maintain opinions of the most extravagant character. Each party charges the other with corrupting the Koran and neglecting its teaching, with having departed from the true faith of Mohammed, and as being in consequence worse than either the Jews or Christians. The Shiites are found chiefly in Persia and Central Asia, most if not all the Persian Mohammedans belonging to this sect. Both parties are represented among the Mohammedans of British India, and it is believed that the Sunites, who recognize the authority of the Sultan of Turkey, are in the minority there—a circumstance of some importance to the British government.

Mohammedanism, as an aggressive power, remained a menace to Christian Europe as late as the sixteenth century, but since then it has been a waning power, and the countries under its influence have been left far behind in the march of progress by their Christian rivals. Still its endurance is at least as wonderful as its early success, and twelve centuries and a half have proved its singular attraction for the sensual but imaginative character of the Orientals, among whom the majority of its professors are still to be found. The faith of Islam yet prevails from the Empire of Morocco to the foot of the Himalayas, and from the southernmost point of the Arabian peninsula to the northern limits of Turkey in Europe. It claims the extensive though decaying empires of Turkey and Persia; and though others, such as that of the Great Mogul, have fallen, it is the political edifice only that has perished, while the religious structure still remains entire. Politically speaking, the power of Mohammedanism has been for ever broken. There is no longer any first-class Mohammedan state; and Turkey, Persia, and Egypt owe the preservation of their independent existence chiefly to the mutual jealousies of the great Christian nations of Europe. But the religion of Mohammed is still vigorous, and the followers of Islam are distinguished among all other religious communities by the firmness and precision of their faith, so that among them religious scepticism is as rare as profound sincerity of belief, attested by devotion and self-denial, is common. At the present day the votaries of Islam cling as closely and proudly to their faith as they did in the first flush of its success, or as they did in the sixteenth century, when the victorious hosts of Solymann besieged the capital of the German Empire and threatened the safety of Europe.

In its inception Mohammedanism was an elevating and reforming influence, and it banished for ever from Arabia many of the darker elements of superstition, beneath which the peninsula had been shrouded. Idolatry and atheism vanished before its lofty doctrines of the unity and infinite perfections of God, of his all-pervading providence, and of the necessity of absolute submission to his will. It was, and is still, an elevating influence, in that it makes every Musselman a member of a vast theocratic, and at the same time democratic, brotherhood. All true believers are commanded by their religion to cultivate the virtues of brotherly

love among themselves; orphans are to be protected; the rights of widows are guarded; slaves are to be treated with consideration; and intoxicating drinks, the indulgence in which is such a serious hindrance to Christian nations, are prohibited. But, on the other hand, we see that politically Islam, from its very nature, is opposed to the growth and maintenance of free institutions. Its ruler combines in himself the chief headship of both church and state, and his government must of necessity be a despotism. Then in accordance with its teachings concerning the Koran, all freedom of thought in religion must be crushed, no further or higher development may be looked for, and the standards of a Bredon chief of the seventh century are made the limits for all ages and times. The evils of polygamy, unrestrained divorce, and slavery, are clearly perceived by Christian nations, but inasmuch as they are permitted by the Koran, it is impossible to persuade Mohammedans that they are hurtful. Tyranny and oppression, a want of energy and enterprise, and the degradation of woman, are among the most prominent and striking of the characteristics of all Mohammedan countries, and they may all be traced directly to the influence of the prevailing system of religion. Further, it must never be forgotten that the consistent Mohammedan recognizes no country but Dar-ul-Islam, "the home of Islam." Wherever Islam reigns there the Moslem is at home and a citizen; wherever it is not supreme he is a foreigner—a sojourner in Dar-ul-Harb, "the home of the enemy." Theoretically the relation between Islam and the rest of the world should be one of undying war, and though the Moslems, in contact with European races, have learned to recognize that the power has passed from their hands to the other side, there is always a latent fanaticism smouldering among them, which may at any time break out into a flame. The future of Mohammedanism it is impossible to foresee. That it is possible for it to be transformed and brought into harmony with modern advanced thought and knowledge is denied by all who are capable of forming an opinion. For an account of Mohammedan doctrines see under KORAN. •See also "Mahomet and Islam," by Sir W. Muir (London, 1884); Bosworth Smith's "Mohammed and Mohammedanism" (London, 1874); and "A Dictionary of Islam," by T. P. Hughes, B.D. (London, 1886).

**MOHICANS**, a tribe of North American Indians, now nearly or quite extinct, which in the seventeenth century inhabited the territory at present included in the northern states. They were dispossessed by the earliest British settlers, and dispersed among the other tribes. The name is well known in consequence of the popularity of Cooper's novel, "The Last of the Mohicans."

**MOHILEV' or MOGILEV'**, a town of Russia, in a government of the same name, is situated in a pleasant, well-cultivated country on the left bank of the Dnieper, and has 40,536 inhabitants, many of whom are Jews. It is the residence of the civil and military governors, of a Greek archbishop, and of the Roman Catholic primate of Russia and Poland. It is also a favourite residence of many of the Russian nobility. The city is surrounded by a decayed rampart, and is divided into four quarters. Many of the streets are broad and paved, and in the centre there is a large square. The public edifices are numerous, and some of them rather splendid, as the Church of St. Joseph. The town has a Greek cathedral, built in 1780, and numerous other Greek and Roman Catholic chapels, several Jews' synagogues, and Greek and Roman Catholic convents, one Lutheran church, a theological college, episcopal seminaries, gymnasium, infirmary, and various other charitable institutions. All the productions of the district are extensively exported to Riga, Odessa, Königsberg, and Dantzic; and the import trade in thrown silk is considerable. Several well-frequented fairs are held in this town.

**MO'HUR**, the gold 15-rupee piece of India, weighs 11·664 grammes (180 grains troy), and its fineness is 9·166; its value sterling is therefore £1 9s. 2d. An attempt was made to fix silver at this standard, 15 rupees to a mohur, but it failed; and the fall in silver has caused the mohur to rise variably to from 16 to 20 silver rupees in value. Gold pieces of 10 rupees and 5 rupees (two-thirds and one-third mohur) are also in circulation.

**MO'IDORE**, an old Portuguese coin worth 4800 reis, that is, about £1 1s. 8d.

**MOIR'AI** (Lat. *Moiræ* or *Parcae*, from the Greek *moira*, a share), the goddesses who dealt out to each man his share or lot in the joy and sorrow of the world. Homer speaks of the one *Moiræ* or Fate, but Hesiod and later poets recognize three Fates. See **FATES**.

**MOIRÉ** (a French word meaning coloured or watered) is applied to surface effects produced on metals and on textile goods. The *moiré métallique* is a tin-plate upon which a peculiar figuring, like that caused by frost upon windows, is produced by dipping the plate in a heated state into nitro-muriatic acid, and afterwards washing with cold water to remove the acid. The plate is then dried and varnished or lacquered. *Moiré antique* is the name given to silks figured by the process called in silk *watering*. This is produced in the calendering. The silks in their finished condition are wetted and folded, and then submitted to an enormous pressure, often hydraulic. By this pressure the air is slowly expelled, and in escaping draws the moisture into curious waved lines, which leave the peculiar mark called *watering*. By using presses hot or cold, embossed or plain, by folding the layers of silk diagonally or rectangularly, various kinds of *moiré* are produced; those threads which happen to be most pressed receive most gloss; some of them become flattened, and the reflection from their surface is glossy or otherwise according to the angle at which they are viewed. Thus a brilliant play of light and shade is produced. Woollen fabrics called *mousses* undergo a similar process.

**MOLASSE**, in geology, is a great series of clays, sands, and conglomerates, with some lignitic seams, that occurs in Switzerland. This deposit is for the most part of lacustrine origin, but it contains intercalated marine beds. The fauna and flora have been exhaustively investigated by Dr. Heer, who considers the lower beds to be of Oligocene age, while the upper portion of the deposit is Miocene. The climate during the deposition of these beds appears to have been subtropical. The flora is allied to that of America, Sequoia and other evergreens being abundant.

**MOLASSES** (Port. *melasses*), the uncrystallized syrup produced in the manufacture of sugar, which is suffered to drain from the casks into a cistern, in what is called the curing-house, before the sugar is sent away from the plantation. [See **SUGAR**.] Part of the molasses is fermented and distilled for rum in the West Indies, and part is made to yield a little sugar by crystallization; the residue constitutes *treacle*.

**MOLD**, the county and assize town of Flintshire, in Wales, is situated on the west bank of the river Alun, 6 miles south from Flint, and 192½ from London, by the North-western Railway. The town consists of one main street, with two or three smaller ones intersecting it at right angles. There are no public buildings except the court-house, church, a free church, several dissenting chapels, and schools. The town has some small manufactures of cottons and woollens, and in the parish are some large collieries. The pleasing variety of the scenery of the neighbourhood renders it very attractive. The population of the town in 1881 was 4820.

The town was anciently known as *Monte Alto*, and is called in Welsh *Wyddgrug*; there are numerous Druidic, Roman, and Saxon remains in the vicinity. About

a mile distant is a noted spot called Maes-Garmon, the scene of a victory gained in the fifth century, by the Welsh over the Picts and Saxons: a pillar, with an inscription, commemorates the event. About 1½ miles also, on the Chester road, are some remains of Offa's Dyke, the ancient boundary between Wales and England.

**MOLDAVIA and WALLACHIA**. See **ROUMANIA**.

**MOLE** (*Talpa*) is a genus of mammals belonging to the order **INSECTIVORA** and family **Talpidae**. The Common Mole (*Talpa europæa*) is one of the most interesting little mammals native to this country. Its general appearance is so well known as scarcely to need description. The body is almost cylindrical, covered with a velvety close fur of a bluish-brown colour, and is 6 inches in length, of which about an inch is occupied by the tail. The whole structure of the head is admirably adapted to its burrowing habits, the snout being very long and pointed, and the external ears and eyes very small; the common mole is not however blind, as is commonly thought. The fore limbs are very short and seem to spring from the neck; they terminate in broad, shovel-shaped feet, each with five toes armed with strong claws. The hind limbs are longer and less powerful. The structure of the fore limbs and sternum or breastbone deserves particular attention. The manubrium or front part of the sternum is very long, and bears on its upper surface a prominent keel, like that of birds, for the attachment of the pectoral muscles; it articulates with the clavicles, which are short, thick bones, connected with the shoulder-blade (scapula) by ligaments. The humerus or shoulder-bone is unlike that of any other mammal, being short, very stout, and irregular in outline; it has two separate articulations, being connected not only with the scapula, but also with the clavicles. In this way the fore limbs are moved forward to the narrowest part of the body, so as to preserve the cylindrical form essential for burrowing, and are at the same time greatly strengthened; in addition, short as the limbs are, the feet can be brought up to the tip of the snout. The bones of the forearm are short and strong. The breadth and power of the hand is further increased by the development of a long sickle-shaped sesamoid bone attached to one of the bones of the wrist. The total number of teeth is forty-four, arranged in the typical mammalian formula:—

$$\begin{array}{cccc} I. & 8-8 & 1-1 & 4-4 & 8-8 \\ & 8-8 & 1-1 & 4-4 & 8-8 \end{array} \quad pm.$$

The food of the mole is exclusively animal, and consists mainly of earth-worms, in pursuit of which it makes its more superficial galleries, often indeed in light soils travelling in a shallow trench. When burrowing the mole gets rid of the earth which it dislodges by throwing it out on



Fortress or Habitation of the Common Mole.

the surface in the form of the well-known mole-hill. The mole is solitary in its habits, forming a symmetrical and ingenious habitation or fortress, which affords rest and protection from its enemies. It communicates with the animal's usual hunting grounds by one or two highroads. The nest is lined with dried grass and leaves; it leads into a passage which first descends, and then ascending runs into the main run. From the nest also ascend three passages to a circular gallery, which in turn communicates by five equidistant passages with a larger

circular gallery at a lower level; from which latter other roads proceed, either to end blindly or to converge into the main road. Such at least is the account given by M. Le Court of the structure of a mole's fortress; but from more recent investigations it seems certain that in some cases at least it is much less complicated. The main road is formed, not by the throwing up of mole-hills, but by the compression of the earth; it is a little wider than the mole's body, and its walls are quite smooth. Earth-worms, as has been said, constitute the principal food of the mole, but it also preys on larvae of insects, frogs, lizards, small birds, mice and shrews, and even those of its own species. The voracity of this little animal is extreme, and ten or twelve hours' deprivation of food is said to be fatal. The mole is a good swimmer. The female brings forth four or five young in a special nest, often at some distance from the fortress. Only one brood is produced in the year. At night the mole is said to come out on the surface. The mole is regarded as a pest by the farmer, and has a war of extermination waged against him. It is, however, doubtful whether the mischief it causes by the construction of its burrows is not compensated by its destruction of wire-worms and other harmful grubs. The professional mole-catcher, however, still plies his trade in all parts of the country. The common mole is found over nearly the whole of Europe, and Asia south of the Himalayas. In Ireland and most of the western isles of Scotland it is unknown.

The mole which Aristotle described as being blind was not the common species, but *Talpa cæca*, a native of Greece and Southern Europe generally, which has its eyes covered by a thin membrane. Several other species of the genus *Talpa* are found in Asia.

The STAR-NOSES (*Condylura*) and the SHREW MOLES (*Scalops*) of North America also belong to the family Talpidae; the GOLDEN MOLES form a distinct family (*Chrysochloridae*).

**MOLE CRICKET** (*Gryllotalpa vulgaris*) is a curious British orthopterous insect, belonging to the family Gryllidae. The mole cricket lives underground like the mole, and has, like that mammal, its fore limbs converted into powerful digging organs. It is a large stout insect, nearly 2 inches in length, and of a dark brown colour. The fore limbs are short, but very broad and strong; the tibiae are flattened and triangular, and terminated by four finger-like processes, which present much of the appearance of the hand of the mole. The muscular power of this insect is so great that it is said to exert a force equal to 2 or 3 pounds. It burrows under the ground like the mole, and raises a ridge as it advances, but seldom throws up hillocks of earth. It prefers damp soil, frequenting moist meadows, the sides of ponds and streams, and gardens by the sides of canals. The mole crickets occasionally do considerable damage by cutting through the roots of plants in the course of their burrowings. Their food consists partly of vegetable substances, but chiefly of worms and insects. They fly only at night, and produce a low dull jarring note, which has been compared to that of a goatsucker. The female lays from 200 to 300 eggs about June, in a gourd-shaped chamber in the ground, having a winding passage to the exterior. The larvae are hatched in five or six weeks, and resemble their parents, except in the presence of wings; they do not arrive at maturity till the third year. The American species (*Gryllotalpa borealis*) is smaller, but agrees with the preceding closely in structure and habits. Another species (*Gryllotalpa didactyla*) has done much damage to the sugar-cane in the West Indies and South America.

**MOLE RAT** (*Spalacidae*) is a family of rodents, combining the general structure of a rat with the habits of a mole and some modifications of structure, with which such habits are necessarily correlated. In this family the body is more or less cylindrical, supported on short powerful limbs. The head is very large and broad, and flat on the crown. The external ears are very minute, or even altogether wanting. The eyes are almost rudimentary, being represented by tiny specks hidden in the fur. The incisor teeth are very large and project beyond the lips; the molars are complex in structure, rooted, and vary in number, from three to six on each side in each jaw. The feet have five toes, of which the first is very small; the toes, especially those of the anterior limbs, bear strong claws. The tail is usually quite rudimentary. The Common Mole Rat (*Spalax typhlus*) is common in Eastern Europe. It is about 8 inches in length, and the fur is soft, dense, and of an ashy-



Mole Rat (*Spalax typhlus*).

gray colour. The eyes are covered by the skin, so that the animal is quite blind. The mole rat burrows extensively beneath the soil, forming long branching galleries, of which those used in feeding run close under the surface, so as to intersect the roots of the plants which grow above; for the mole rat, unlike the mole, feeds exclusively on vegetable matter, chiefly on roots. These animals move very rapidly underground, and seldom quit their burrows. Unlike many rodents, they neither hibernate nor lay up a store of food for the winter. In the genus *Rhizomys*, which is nearly allied to *Spalax*, the eyes are very minute, but are not covered by skin, and there is a short tail and short ears. There are three species, of which two are African, and one inhabits South-eastern Asia. A nearly-allied North African species, *Heterocephalus glaber*, is remarkable for having the body almost entirely naked, only a few scattered minute hairs being present. Another genus of mole rats, *Bathyergus*, is almost confined to South Africa. The Strand Mole Rat (*Bathyergus maritimus*), the sand mole of the Dutch colonists, is about 10 inches in length, exclusive of the tail, which measures 2 inches. The external ears are wanting, but the eyes, though small, are not covered with skin. The fur is grayish-white. The strand mole rat inhabits sandy plains near the coast, where it burrows freely, forming a complex system of branching galleries, generally radiating from several centres. The ground is often so undermined by these burrows as to become dangerous to riders. This animal often invades cultivated lands to feed on roots, &c., and is therefore regarded with dislike by the colonists, who destroy it. The Cape Mole Rat (*Georchus capensis*) belongs to a closely-allied genus, of which five species inhabit Cape Colony.

**MOLECULE**, a chemical term signifying the smallest quantity of a compound body or group of atoms which can enter into any chemical reaction. For instance, the molecule of ammonia is  $\text{NH}_3$ , the atomic weight or combining equivalent of which is 17—the weight of the hydrogen atom being taken as unity, that being the smallest quan-

tity of ammonia which enters into combination. The molecule of water is  $H_2O$ , the atomic weight of which is 18, as no smaller quantity can be made to enter into combination or separated from any compound containing it. The molecule of hydrochloric acid is more simple; it is  $HCl$ , the atomic weight of which is 36.5. The hydrogen in hydrochloric acid can be replaced by one atom only of another element or by another compound molecule, in water by two atoms or molecules, in ammonia by three atoms or molecules—in each case forming another compound having the same general type.

Molecule is, in fact, the name given to the ultimate groups of atoms of which matter is composed. In pure elementary bodies the molecules would be, by the hypothesis, actual atoms or combinations of atoms with each other (an atom being an inconceivably minute and indivisible portion of homogeneous matter), but in all compound bodies the ultimate particles are of course not atoms, but groups of dissimilar atoms. For instance, the ultimate particles of water are not atoms, sometimes of oxygen, sometimes of hydrogen, but they are molecules or combined groups, always composed either of one atom of oxygen with two of hydrogen or of a multiple of that proportion.

*Molecular forces* are the forces which bind together the atoms into molecules, and which regulate the relations of the molecules themselves, so that the body made up of them assumes the solid, liquid, or gaseous state.

The further consideration of molecules, their maximum size, &c., is entered into in the articles *ATOM* and *ATOMIC THEORY*.

**MOLESKIN** is the name given to a stout heavy fabric of cotton woven as a satin twill on strong warps. It is sometimes printed in imitation of tweed, but more usually it is finished a bleached white or a slaty colour. Being very tough and durable it was formerly much used for the garments of labouring persons, and for the clothing of male inmates of workhouses, &c., but latterly it has gone out of favour. For carriage covers, gun cases, &c., it is very useful.

**MOLESWORTH, SIR WILLIAM**, an English politician and a leading member of the "philosophic Radicals," was born in London, 23rd May, 1810, and succeeded to extensive family estates in 1823. Educated at Cambridge and Edinburgh, and in Germany, he entered Parliament in 1832 as member for the Eastern Division of Cornwall. He afterwards, from 1837 to 1841, represented Leeds, and in 1845 was returned for the borough of Southwark, which position he retained till the end of his life. As a member of the House of Commons his speeches, though few, were of a valuable character. He was a warm advocate of the ballot, and he devoted special attention to the condition of the colonies. He attacked with success the system of transporting convicts out of the kingdom, and at last in July, 1855, he was called to preside over the Colonial Office. He had, however, no opportunity to display his powers of administration, as his career was cut short by death, 22nd October, 1855. In its eulogistic notice of his life the *Times* referred to him as "the liberator and regenerator of the colonial empire of Great Britain."

Sir William Molesworth was a man of literary tastes, and he was one of the founders of the *London Review*. He afterwards purchased the *Westminster Review*, and after amalgamating the two magazines, he acted for some time as editor in conjunction with his friend J. S. Mill. His chief literary undertaking, however, was the issue, at a cost of £2000, of a complete edition of the works of Hobbes, and he commenced, but did not complete, a biography of that philosopher.

**MOLIÈRE** was the name assumed by the great comic dramatist and actor, Jean Baptiste Poquelin. Molière was born in Paris on the 16th of January, 1622. His father held the office of "valet-de-chambre-tapisier" to

Louis XIII. Young Poquelin was sent to the Collège de Clermont, which was under the care of the Jesuits, where he remained till the end of the year 1641. When his studies both in literature and philosophy were ended, he filled his father's office about the king's person, and attended Louis XIII. in the expedition of 1642, distinguished by the capture of Perpignan from the Spaniards. In 1645 we find him performing in the Faubourg St. Germain with a company of amateurs who at first acted for pleasure, but afterwards attempted to combine profit with amusement. At this period he assumed the name of Molière. The company was unsuccessful. In 1653 he was playing at Languedoc, whither he had been invited, as the head of a company, by the Prince de Conti, who appreciated his histrionic talents. In the company was Madeleine Béjart, with whom he became on terms of the closest intimacy, and whose daughter, or, as some authorities say, sister, subsequently became his wife. He afterwards went with his company to Lyons, where, in 1653, he produced his first play, "L'Étourdi," with much success. In 1654, having returned to Languedoc, he produced "Le Dépit Amoureux," which was likewise successful. After remaining four or five years in Languedoc, the company quitted that province for Grenoble, where they played during the carnival. They then went to Rouen, and finally to Paris, where Molière was introduced to the king, Louis XIV., before whom his company played the tragedy of "Nicomède," in 1658, at a theatre erected in the guard-hall of the old Louvre.

In 1660 Molière's company removed to the Palais Royal. It is curious that the public to the last loved Molière chiefly as a comic actor, and failed to see the transcendent merit of his works. Even Louis XIV., when Racine named Molière, in reply to the king's inquiries who had been the most illustrious man of letters of his reign, answered, "I should not have thought him so." In 1659 Molière produced his celebrated "Précieuses Ridicules;" and in 1660 he wrote "Le Cœu Imaginaire." "Don Garci de Navarre," brought out in 1661, was unsuccessful; but his fame was again raised by the "École des Maris," which was produced in the same year with great success, and was followed by an exquisite trifle, "Les Fâcheux." In 1662 appeared "L'École des Femmes." Molière was so indignant at the hypercriticisms on this fine comedy, that in 1663 he retaliated on his critics in "La Critique de l'École des Femmes," in which he held them up to public derision. A little piece entitled "L'Impromptu de Versailles" was produced the same year, which consists merely of a satirical conversation among the comedians. It is preceded by a "Remerciement," or poem of thanks to the king, who had, in the year of its production, granted Molière a pension of 1000 livres. Molière's happiness would have been greater had he not married Armande Béjart, then about seventeen, whose lively and coquettish disposition kept him in all the agonies of jealousy. To relieve himself from domestic disquietude, he pursued his labours with additional ardour, and wrote "Le Mariage Forcé," and "La Princesse d'Élide," which were produced in 1664, and "Le Festin de Pierre," produced in 1665. In this year the king engaged Molière's company for his own service, granting them a pension of 7000 livres, and they took the title of Troupe du Roi. A dramatic trifle called "L'Amour Médecin" followed up the attack on the medical profession, which Molière had incidentally commenced in the "Festin de Pierre."

His excellent comedy "Le Misanthrope" was produced in 1666, and is reckoned among his *chef-d'œuvre*. In the same year appeared "Le Médecin malgré Lui," a humorous attack on the physicians, well known to the English stage by Fielding's version, entitled the "Mock Doctor." With respect to the date of the celebrated comedy "Le Tartuffe" there is a little difficulty. The first three acts of "Le Tartuffe" seem to have been played

In 1664, but the entire piece was not acted till 1667. However this may be, on its very first production the more bigoted part of the community were enraged, and such earnest applications were made to the king that he ordered the piece to be withdrawn. The representations of Molière induced the king to revoke this order, but the dramatist did not consider it prudent to perform it till 1669, when it at once established itself as his masterpiece. About the same period he produced three trifling pieces, "Melicerte" (a mere fragment), "Pastorale Comique," and "Le Sicilien;" and in 1668 appeared his "Amphitryon." The admirable comedy of "L'Avare" seems to have been brought out in the same year, and now also Molière ventured on the second representation of "Le Tartufo." "Monsieur de Pourceauguac," a farce representing the awkwardness of a pompous country gentleman in a large metropolis, was represented in 1669 with great success, and the famous "Bourgeois Gentilhomme," produced in the following year, was equally fortunate. It was followed in 1671 by "Les Fourberies de Scapin." In 1672 Molière composed his "Femmes Savantes," one of his best comedies, in which the learned ladies and wittlings of the time are admirably satirized.

In the year 1672 Molière became reconciled to his wife, with whom he had long been at variance, and at the same time quitted a milk diet, to which he had restricted himself on account of a complaint in the chest, for animal food. This increased his complaint, but he worked hard at the composition of "Le Malade Imaginaire," which was produced in 1673, and is among his finest works. On the third day of the representation of this comedy Molière felt the pain in the chest much increased, and while acting the part of Argan a convulsion seized him. Soon after his arrival at home he began to spit blood, which at length flowed from his mouth in such abundance as to suffocate him, and he died at ten in the evening of 17th February, 1673. Actors at this time were, by their profession, excommunicate. Louis XIV. desired the archbishop, however, to waive forms, and to bury Molière in consecrated ground. It took all the king's diplomacy to effect this, and even then the ceremony had to be performed at night in a half surreptitious manner. He was interred in the cemetery of St. Joseph, and his remains were transferred with some pomp to Père la Chaise in 1817.

Molière is the prince of comic dramatists, equal even to Shakespeare in this branch of the art. No other writer of comedy is so inexhaustible in resource, so genial in humour, so skilful in the portrayal of character, and so felicitous in language, nor has any other stripped the veil from vice with such eloquent boldness. This arises no doubt from the colossal intellect being humanized and broadened out of all bitterness by the sweet nature of the man, shown in his friendship alike with the king and with his own servants; his patience under insult and under misfortunes and ill health; his constant friendliness and generosity, and his ready appreciation of great merit. Few authors have been so painstaking towards their audience. It was Molière's constant habit to read over his finest work to his faithful servant Laforest, and if the old peasant woman failed to chuckle over the situations or the speeches of his characters, or to understand his allusions, the work was condemned to further emendation; for he had determined to please and satisfy every intelligent person, however uncultivated. An English translation of Molière's works by M. Van Laun appeared in 1876.

**MOLINA, LUIS**, a Spanish Jesuit and theologian, was born at Cuenca, in 1535. He became a member of the Company of Jesus at the age of eighteen, and afterwards became professor of theology at Evora in Portugal, where he remained twenty years. He was removed from this post to fill the chair of moral theology at Madrid, where he died 12th October, 1600. He was the author of several theological works, but the treatise for which he

became famous was that entitled "Liberi Arbitrii cum Gratiae Donis, Divinae Præscientiæ, Providentiæ, Prædestinationis et Reprobationis, Concordia" (4to, Lisbon, 1588). In this work he maintains the doctrine that the free action of the human will is a necessary condition to the efficacy of divine grace, but his teachings, though in harmony with the feeling then prevailing in the Roman Catholic Church, were assailed by the Dominicans, and a violent controversy arose. The Pope was compelled to interfere in the dispute, and after enjoining silence upon both parties he appointed a council *De Auxiliis Gratiae* to decide upon the matter. After 200 sittings the council was dismissed in 1607 by Paul V., who promised to give a decision upon the question at a fitting time, which, however, never arrived. He forbade the disputants to write any more upon the subject in 1611, but the injunction was but imperfectly obeyed, and the Molinist subsequently became merged in the Jansenist controversy. A modified form of Molinism has since been taught in the Jesuit schools of theology.

**MOLINOS, MIGUEL DE**, a celebrated Quietist, was born of good family near Saragossa, in 1627. Having entered the priesthood of the Roman Catholic Church, he settled at Rome about his fortieth year, and soon gained great popularity as a confessor. Among his many distinguished friends was Cardinal Odescalchi, afterwards Innocent IX. In 1675 Molinos published a small duodecimo volume entitled "Guida Spirituale," which soon became vastly popular and obtained a wide circulation. Innocent IX. provided the author with rooms in the Vatican, and showed him much favour; but in 1681 the "Guida Spirituale," or rather its teaching, was attacked by the Jesuit preacher Paolo Segneri, and a fierce controversy arose. Molinos was at the outset defended by the Inquisition, and the works of his opponent were branded as false and heretical; but in 1685 he and his friend Petrucci were laid under arrest, and the whole of the papers of Molinos were seized. Petrucci was soon afterwards liberated and raised to the rank of cardinal, but Molinos was kept in prison, and sixty-eight doctrines imputed to him were condemned as heretical by the Inquisition. This condemnation received papal approval, and though Molinos saved his life by abjuring his opinions he was never released, and he died in the prison of the Inquisition, 28th December, 1696, the epithet *Hæreticus* being placed upon his tomb. In addition to the charges of heresy laid against him, he was also accused of immorality, but the evidence upon which these accusations were based is unknown.

Molinos taught that the pious soul must enjoy quietude in abstraction from visible objects, so that, drawn into itself, it may become more susceptible of spiritual influence, intellect and will being merged in God. As such a doctrine was in opposition to church ceremonial and all externalism, it roused the enmity of the Jesuits, to whom mysticism and Jansenism were as hateful as Protestantism.

**MOLL**, in music, the German term for *Minor*.

**MOLLAHS**, among Mohammedans, are a superior order of judges, and expounders of the religious, civil, and criminal laws. The four chief mollahs who preside over the important pashalies of Adrianople, Brusa, Damascus, and Cairo, are officials of the highest rank. Mollahs of lower rank are appointed monthly to exercise their functions in the principal seats of justice, and also in many inferior towns and districts. In Persia the office of mollah is similar to that in Turkey; but in Turkestan the mollahs have nearly all the power of the government in their hands.

**MOLLUSCA** is one of the great subkingdoms of the animal kingdom. The mollusca are soft-bodied, unsegmented animals without lateral locomotory appendages. The integument of the dorsal surface is generally produced into a fold, the mantle. The cavity between the free portion of the mantle and the body-wall is the subpallial chamber, within which are usually developed respiratory

organs, the branchiæ or gills, and into which open the kidneys and alimentary canal. In the most typical mollusca the ventral surface of the body is highly muscular, and forms a locomotive creeping organ, the foot, which undergoes various modifications in shape. In most cases a shell is secreted, a cuticular product of the mantle; it may grow very large and unsymmetrical, as in most gastropods, or be altogether absent, as in a few of the same group, or consist of two valves, as in the Lamellibranchiata, or be internal, as in most of the cephalopods. In the alimentary canal, œsophagus, stomach, intestine, and rectum can generally be distinguished; and a large liver is usually present. The kidneys are often paired and symmetrical, but often one is rudimentary or wanting; they open on the one hand into the pericardium, the chamber in which the heart is situated, and on the other to the exterior. The heart is systemic, and consists of a ventricle and two auricles, of which one of the latter is often suppressed. Definite capillaries are not known to exist in molluscs, the blood collecting more or less in irregular spaces called lacunæ. Respiration is usually by means of gills; more rarely, as in the pulmonate gastropods, the subpallial chamber forms a lung. The nervous system usually consists of a pair of cerebral ganglia over the mouth, united by an œsophageal nerve-ring, with the pedal ganglia in the anterior region of the foot, and with visceral ganglia lying posteriorly among the viscera. Tentacles forming organs of touch are often present on the head; in the headless lamellibranchiata the labial palps fulfil this office. There are usually two eyes on the head, but in the lamellibranchiata they are scattered on the edge of the mantle, and in the clitons, which are the most primitive gastropods, there are curious eyes and tactile organs on the shells. Auditory organs are usually present in the form of otocysts, closed vesicles containing a calcareous concretion. Reproduction is always sexual, but hermaphroditism is common. In development the Mollusca typically present a trochosphere larva, similar to that of annelids and other forms, which becomes a veliger, so called from the velum, a fold of integument fringed with cilia, developed in the cephalic region, and functioning as an organ of locomotion. The majority of the Mollusca are inhabitants of the sea; many are fresh-water forms, and a few only live on land.

The Molluscan subkingdom, as now restricted, consists of the following classes:—GASTROPODA, SCAPHOPODA, PTEROPODA, CEPHALOPODA, and LAMELLIBRANCHIATA. The first four classes differ from the last in the presence of a well-developed head and of a remarkable rasping organ, the odontophore or tongue. Three other classes are often placed in this subkingdom—Tunicata, Polyzoa, and Brachiopoda—the first of which presents remarkable affinities to vertebrates, and is by some placed in that subkingdom, while the two latter must provisionally stand alone.

The Plates prefixed to this volume show some of the various forms of shells in this subkingdom.

**MOLLWITZ**, the site of Frederick the Great's first battlefield, is a hamlet lying 7 miles west of Brieg, on a tributary, of the Oder, and not far from Breslau. The battle was fought on the 10th of April, 1741, the forces on both Prussian and Austrian side being about 20,000. The battle went well for Frederick at first, but the entire cavalry of his right wing being by a series of accidents overthrown, the day seemed lost, and the young king was besought, especially by Marshal Schwerin, to leave the field. He "disappeared into fairyland," as grim Carlyle puts it ("Frederick the Great"), but the fine discipline of the Prussian infantry, due to his father, and the excellent disposition of the battle, due to his own skill, rose superior to the severe check the Prussians had received; affairs righted themselves and a victory was won. After some hours, during which he was once practically in the enemy's hands (had they sought to take him prisoner instead

of firing at him), the news of the victory reached the king, and Frederick wrathfully rode as madly back to Mollwitz as he had ridden from it. He had been absent for sixteen hours. He never pardoned Schwerin for giving him the advice to fly. The results of Mollwitz upon Europe were prodigious. France allied itself with Prussia, and Silesia was lost to Austria. Every one felt that with this young soldier a new era had come.

**MOLOCH** or **MOLECH** (Heb. *melech*, king), an honorific title meaning supreme ruler, applied to the divinity of the Ammonites in the Old Testament. The first direct historical allusion to the worship of Moloch is found during the reign of Solomon, who is charged with the building of high places for the worship of Chemosh and Moloch (1 Kings xi. 7), the latter deity being also referred to in the same chapter as Milcom. The element of fear seems to have entered largely into the conception of the attributes of Moloch, and his worshippers sought to appease his anger in times of extremity by offering up their children as sacrifices. The practice is referred to as being a common one among the surrounding nations, but there is no clear evidence that it was practised to any great extent among the Jews until a comparatively late period of their history. That the offering of human sacrifice was not unknown to them at earlier periods of their history is evident from the stories of Abraham and Isaac, the sacrifice of Jephthah's daughter, and the sacrifice of seven men, sons of Saul, who were hanged up before Jehovah at a time of famine (2 Sam. xxi. 1-14); but such offerings seem to have become common and frequent only in the period of prolonged trouble and danger which preceded the downfall of the two kingdoms. Compare Lev. xviii. 21; Deut. xii. 81; 2 Kings xvi. 8; xxi. 1-6; Ps. cvi. 36-38; Jer. vii. 31; xix. 5; Ezek. xvi. 20-21; xxiii. 87, 89. Some attempts have been made by the later Jewish rabbins to explain the phrase "passing through the fire" as a rite of purification, a passing between two fires, but the allusions to actual slaughter in most of the passages referring to the practice are too plain to be mistaken. The tradition that Moloch was represented as a calf-headed brazen image, within which, or within the arms of which, the children offered were burned alive, though often repeated, is now regarded as fabulous. The passages referring to these sacrifices in the Old Testament certainly favour the idea that the children offered were killed like ordinary victims, and that after their blood had been poured out their bodies were burnt on the altar of the deity. Compare Isa. lvii. 5; Jer. xix. 4; Ps. cvi. 38.

**MOLOCH** (*Moloch horridus*) is one of the most uncouth and awful-looking of LIZARDS. It is a native of Western Australia, and belongs to the family Agamidae. The body of this lizard, which bears the name of Milton's "horrid king," is covered from the head to the end of the tail and on the limbs with numerous spines. The body is depressed, about 6 inches in length, and bears the spines in rows. The head is very small, and furnished with two or three very large spines, which look like horns. The body is brilliantly coloured, the under surface being covered with black-edged dark red spots. In spite of its formidable appearance the moloch is quite harmless.

**MOLOTHRUS.** See COW-BIRD.

**MOLTKE, HELMUTH KARL BERNHARD, COUNT VON**, chief marshal of the German Empire, the son of an officer of the Mollendorf Regiment, was born at Gnewitz, his father's estate, near Parchim, 26th October, 1800. Soon after his birth his parents settled in Holstein, and in his twelfth year the young Moltke was entered in the Copenhagen military school. In 1822 he entered the Prussian army as a lieutenant of the 8th Regiment of infantry, and studied at the military academy and at the divisional school at Frankfurt-on-the-Oder. In 1835 he went to Turkey, and receiving a commission from the

Porte was consulted by Sultan Mahmud on the reorganization of the Turkish army. He remained in the Turkish service several years, and in 1839 took part in the campaign against Mehmet Ali and his eldest son, Ibrahim Pasha. In 1845, having returned to Prussia and published an account of his Turkish experiences in his "Briefe über Zustände und Begebenheiten in der Türkei, 1835-39" (Berlin, 1841; English translation, 1877), he became adjutant to Prince Henry of Prussia, then resident at Rome. After the death of the latter he was engaged in connection with the general command of the Rhine, becoming a member of the Grand General Staff in 1848, and in 1849 chief of the staff of the 4th Army Corps in Magdeburg. In 1858 he was raised to the rank of chief of the Grand General Staff, and was made lieutenant-general the year following. In the Austro-Italian War of 1859 he accompanied the Austrian headquarters. After the conclusion of peace he devoted himself with the utmost energy towards the development of the Prussian army, and as chief of the staff he planned the invasion of Denmark in 1864. Two years later the time had come for the display of his full powers, and the efficacy of the plans and methods he had been preparing so long was triumphantly established in the crushing defeat of the Austrian army. The whole plan of the Bohemian campaign was due to Moltke, who was present at the battle of Königgrätz (1866), and it was he also who arranged the bold advance of the Prussian column against Olmütz and Vienna, and who arranged the terms of the armistice and the preliminaries of peace after the defeat of the Austrians. For these services he received a national dotation, and was invested with the Order of the Black Eagle. His next great work was to prepare for a probable war with France, and while the army of the latter country was year by year becoming weaker through maladministration and corruption, everything was made ready in Prussia, under his careful supervision, for the coming struggle. On the 15th July, 1870, the French emperor declared war against Prussia, and by the 3rd August the German troops had begun to enter France. Five hundred thousand men had been by this time mobilized in Germany and drawn up to the French frontier, so that, in accordance with the plans of Moltke, they entered France in four great armies. His masterly strategy was carried out with an energy and zeal on the part of the German commanders which left nothing to be desired, and the tide of victory, which began at Weissenberg (4th August, 1870) rolled on in an almost unbroken current until 28th January, 1871, when the war was brought to an end by the surrender of Paris. On 28th October, 1870, Moltke was created a count; in September, 1871, he was appointed chief marshal of the German Empire, and was awarded a second national dotation. It was said of "Vater Moltke," as he was familiarly termed in the Prussian army, that he "could keep silent in seven languages;" but an address he made to the German Reichstag in 1877, on the necessity for maintaining the efficiency of the German defences, showed that he could speak in an elegant and impressive manner when he pleased. Acting in accordance with his own declaration, that the gains of one year's campaign would have to be guarded for half a century, he spared no pains after the war with France to increase the efficiency of the German army, and to strengthen and render impregnable the fortifications of the country. Of his literary works the more important are "Der Italienische Feldzug von 1859" (third edition, Berlin, 1870), and "Der Deutsch-Französische Krieg" (Berlin, 1873). An English translation of his "Observations on the Influence that Arms of Precision have on Modern Tactics" was published at London in 1871.

**MOLUCCA ISLES, or SPICE ISLANDS**, constitute a part of the Indian Archipelago, dispersed over the sea which extends from the eastern coast of Celebes to the

western coast of Papua, or New Guinea, and covering an area of about 450 miles from east to west and 800 miles north to south. Nearly all these lands are mountainous, and some of them contain peaks which rise to the height of 7000 or 8000 feet. The rocks of which they are composed are mostly of a volcanic nature, and there are at least eight volcanoes still in action. Like other volcanic countries, the surface is very rugged and broken, though the lower regions possess a great degree of fertility, and the coast has many sheltered harbours. As none of these islands are more than 9 degrees from the equator, the climate is hot all the year round, but the heat is not excessive, on account of their comparatively small size and the uninterrupted continuance of the monsoons for at least ten months of the year.

The agricultural productions do not differ from those of Java, with the exception of rice, which is not cultivated, but imported. The common food of the people is derived from the sago-palms. Fish, wild deer, and hogs are also articles of food. Fine woods and fruit are produced; and the sago plant forms immense forests. But the islands are best known for the cultivation of nutmegs, cloves (from French *clou*, a nail), and other valuable spices, which are extensively exported. In addition to these articles they send to the markets of China edible birds'-nests, sea-slugs, and shark-fins. A small quantity of gold is also exported, as well as birds of paradise. In the neighbouring seas are pearl and treping fisheries.

These islands, like nearly all those which constitute the Indian Archipelago, are inhabited by two races, the Malays and the Papuans. The Malays are in possession of the coasts, where they cultivate the ground or gain their subsistence by fishing. The Papuans have been extirpated on the smaller islands, but they still maintain their ground in the mountainous districts of the larger islands. The islands may be divided into three groups: the Gilolo group, or Proper Moluccas; the Ceram group; and the Timor Laut group. The Gilolo group is the most northern, and extends from 2° S. lat. to 5° N. lat., and contains the islands of Gilolo, Morty, Mandioly, Batchian, Ooby, and Mysole, with numerous smaller islands lying between and about them, among which the islands of Ternate and Tidore are the most important. The Ceram group occupies the middle, between 3° and 5° S. lat., and comprehends the two large islands of Ceram and Booroo, and among the smaller ones, which lie to the south of them, the Spice Islands, or Amboyna and Banda Islands.

*History.*—The Portuguese took possession of the Moluccas in 1510, but about 100 years later the Dutch drove them out and established a complete monopoly in the spice trade. In 1796 the British took possession of them, and kept them till the peace of Amiens (1801), when they were restored to the Dutch. The British again took possession of them in 1810, and again gave them up to Holland at the treaty of Paris in 1814. Since that time the Dutch have abandoned some of the smaller establishments, but they still maintain several in the principal islands. The population is estimated at 500,000.

**MOLYB'DENITE** (from Gr. *molybdain*, lead) is the sulphide of molybdenum (MoS). It is a mineral closely resembling graphite in appearance, but giving a streak with a shade of green in it, and a sulphur reaction before the blowpipe. It is soluble in nitric acid. It occurs in scales and foliated masses disseminated through or in veins in granite, gneiss, mica slate, crystalline limestone, and other metamorphic rocks. It has a specific gravity of about 4.5, and hardness slightly over 1. It is the only commercial source of molybdenum, which has little use except as a chemical reagent.

*Molybdine* or *molybdic acid* is the trioxide of molybdenum. It is of a straw-yellow colour, and occurs associated with molybdenite, from which it is probably formed



by alteration. With the bases molybdic acid forms molybdates, of which lead molybdate or *wulfenite* occurs in nature.

**MOLYBDE'NUM**, a somewhat rare metal, found native as molybdate of lead in wulfenite, and as sulphide in molybdenite, which resembles plumbago. It was first discovered by Scheele in 1778. The symbol is Mo; the atomic weight, 92. It can be obtained by exposing the oxide to a white heat with charcoal, or by passing hydrogen gas over the oxide heated to whiteness in a porcelain tube. It can be fused in an oxyhydrogen gas furnace, and presents a white silvery mass, of specific gravity 8.6, and harder than topaz. It is unalterable in the air, but is easily oxidized when heated. It forms alloys with iron, lead, tin, copper, silver, gold, platinum, and aluminium, rendering these metals brittle and less fusible.

It forms three oxides—protoxide or molybdous oxide ( $\text{MoO}$ ), dioxide or molybdic oxide ( $\text{MoO}_2$ ), and trioxide or molybdic acid ( $\text{MoO}_3$ ).

**MOLYB'DOUS OXIDE** is a black substance insoluble in acids, but the hydrate is slowly acted on, forming molybdous salts, which are black in solution and readily oxidized. Molybdic oxide is found native as molybdiin or molybdic ochre; it is reddish-brown, and little acted on by acids. The hydrate is soluble in acids, forming molybdic salts, which give reddish-brown solutions. Molybdic acid forms white silky scales, melting at a red heat to a yellow liquid, which crystallizes on cooling. In a current of air it sublimes unchanged. It requires 500 parts of water for solution, and combines with bases, forming salts called molybdates. Those of the alkalis are soluble in water; those of the metals are insoluble. The most important is the molybdate of ammonia, which is much used in quantitative analysis for the estimation of phosphoric acid in phosphated manures.

The molybdate of lead is found native as wulfenite in fine red crystals. Molybdenum forms three chlorides, dichloride ( $\text{MoCl}_2$ ), trichloride ( $\text{MoCl}_3$ ), and the tetrachloride ( $\text{MoCl}_4$ ), and three bromides of a similar character.

There are also three sulphides, disulphide ( $\text{MoS}_2$ ) found native, as molybdenite, in Cornwall; the trisulphide ( $\text{MoS}_3$ ), and the tetrasulphide ( $\text{MoS}_4$ ). Oxides of molybdenum are recognized by giving a green bead in the outer flame of the blowpipe with microcosmic salt, which becomes colourless on cooling. In solution the molybdous salts are black, and give a black precipitate with alkalis, soluble in ammonium carbonate. The molybdic salts in solution are reddish-brown, and behave in a similar manner with alkalis.

**MOMBAS'** or **MOMBASA** is a town situated on the coast of Zanzibar, on the eastern side of an island situated in a bay, which is about 8 miles long by 2 miles broad, and forms the best harbour in Zanzibar. The cliffs surrounding the island are steep, and the castle, on a rock on the south side of the town, was built by the Portuguese in 1635. The population is estimated at 20,000. Ivory is the chief export. Vasco da Gama visited the port in 1498, and in its reefs he was nearly wrecked, while at Melindè, a little to the north, he made his first landing after rounding the Cape. The Portuguese entertained vague ideas of a Mount Olympus of Ethiopia, somewhere to the west of Mombasa, and beyond it they placed those "Mountains of the Moon" which figure on some old maps. The Mount Olympus may have referred to Kilimanjaro. In 1834 the authority of the Sultan of Zanzibar was established, and the British assisted him to suppress a revolt in 1875. In 1875-76 a settlement for liberated slaves was established by the Church Missionary Society at Mombas.

**MOMENTUM**. This word has been used in several senses. *Momentum* (*movimentum*) was originally one rapid motion when it came to be used for a very short time; whence our word *moment*, which, in common

speech, means an indivisible instant of time. This an effect which requires a single second to produce it would not be properly momentary. But the word has passed into mechanics in its original simple sense of motion, and is used to signify the amount of an effect of motion, actual or conceivable. Thus we have one use in the article *VIRTUAL VELOCITIES*, another in *LEVER*, a third in *Momentum of Inertia* (explained beneath), and a fourth, the most common of all, which we proceed to explain.

The English synonym of this fourth sense is *quantity of motion*. It is impossible to give an actual definition of momentum in simple terms; but the conception is obtained by those who observe that the effects produced by *matter in motion* (both notions are necessary) may be augmented either by giving the same motion to more matter, or greater motion to the same matter. A heavy blow, for instance, does not mean a blow with a heavy body; the fall of a poker may give a light blow, while that of a book of one-tenth part of its weight may give a heavy one. The difference in these cases is that of momentum.

The velocity remaining the same, the momentum or quantity of motion increases with the mass moved; and the mass remaining the same, the momentum increases proportionally to the velocity communicated. But the peculiar proposition on which the utility of the term and the notion depends is this, that in all mechanical effects produced by matter in motion, a diminution of the mass may be compensated by a proportionate increase of the velocity; that is, M being the number of units of mass, and V of velocity, as long as the product of M and V remains the same, the effect produced is the same. Thus  $2 \times 100$  is equal to  $1 \times 200$ . This product MV is the measure of the momentum, and is generally called the momentum itself.

*Momentum of Inertia*. Let us conceive a system of bodies possessing weight, and immovably attached to a fixed axis, round which the whole system can turn. It is known from experience, as well as deducible from the laws of motion, that the nearer the bodies are placed to the axis, the more rotatory motion may be communicated by a given force. The *moment of inertia* is a name given to a mathematical function of the masses in the system, and of their positions with respect to the axis, on the magnitude of which the rotatory motion produced by a given pressure, acting for a given time, depends. This function is the sum of the products made by multiplying the number of units in each mass by the number of units in the square of its distance from the axis. Thus, if  $m, m', m'', \&c.$ , be the masses of material points situated at the distances  $r, r', \&c.$ , from the axis, the moment of inertia is  $mr^2 + m'r'^2 + m''r''^2 + \&c.$

**MO'NA**, the ancient Roman name for the Isle of Anglesey, chief seat of the Druids, invaded by Suetonius A.D. 61, and conquered by Agricola in 78. By a misapprehension founded on a slip in Cæsar's geography, *Mona* is often used as meaning the Isle of Man.

**MONA'CO**, the Principality of, a small state on the Gulf of Genoa. It consists of the towns of Monaco, Monte Carlo, with its well-known Casino, and the village of Condamine, and has an area of about 8 square miles, with a population of 7000. The climate is delightful. Monaco, including MENTONE and ROCCABRUNA, belonged to the family of Grimaldi, and existed as an independent principality from the tenth century. In 1814 it was placed under the protection of Sardinia until the greater part of it was purchased by France, February, 1861. Its revenue is entirely derived from the gambling Casino.

MONACO, the ancient *Herculis Monaci Portus*, is built on a steep naked rock rising above the sea-coast, and has about 1800 inhabitants and a harbour for small vessels. The ancient castellated palace, with numerous modern additions, is interesting, and the climate and scenery are very



fine. Attached to the church is a recently restored Benedictine abbey, and the Jesuits have a fine college and convent.

**MONADS**, a conception of the elementary parts of all existing things, due to Giordano BRUNO (born 1548, burnt by the Inquisition at Rome, 1600). Bruno held that all things consist of monads, minute points, probably spherical, but quite infinitesimal, and of both mental and material qualities, whence their name (Greek *monos*, the one or the only). No body is altogether soulless, no soul altogether bodiless; and God is the monad of monads, since all things are perfectly blended in him, the world being nature realized (*natura naturata*), God being nature working (*natura naturans*).

This conception, in the hands of the great Leibnitz (1646-1716), became one of the chief doctrines of the philosophy of the eighteenth century. The monads of Leibnitz are mere indivisible points (as those of Bruno), and may truly be called atoms, but they differ from the atoms of the ancients in being endowed with ideas. Matter, as we know it, seems infinitely divisible, therefore it must be regarded as an aggregate of molecules; but Leibnitz regarded these thinking molecules as themselves indivisible, because they are mere points without magnitude; and such real substances are indestructible and uncreatable, save by the divine will. Matter is extended, and thought does not possess the quality of extension; here, however, we have the conception of matter as unextended, as falling into mere points in its ultimate division, and therefore at one with thought or ideas, which are also unextended. Monads differ also in their power and quality according to the clearness of their ideas. God alone has none but adequate ideas. The monads of the class of human souls have some clear and some adequate ideas, but not all; those of less rank have ideas of less clearness, and so on, till the souls of the lower animals possess but sensation and memory. Every soul is a monad, being indivisible, every body an aggregate of monads. Plants and minerals are sleeping monads with unconscious ideas, manifested, however, in plants as formative vital forces. The moral and mental world is in constant harmony with the physical world, and the ideas of the monad accompany the corresponding motions or actions, which, however, they do not *cause*. Leibnitz compares this "pre-ordained harmony" to the synchronous action of two exactly similar clocks set going at once, and continuing throughout all time.

The monads of Kant are not points, but simple extended particles, resembling therefore the original monads of Bruno rather than the highly-wrought fancies of Leibnitz.

**MONAGHAN**, a county in the province of Ulster, in Ireland, is bounded north by Tyrone, east by Armagh, south-east by Louth, south by Meath, south-west by Cavan, and west by Fermanagh. Its greatest length north to south is 37 miles; its greatest breadth east to west is 28 miles. The area is 498 square miles, or 318,806 acres. The population in 1841 was 200,442; in 1881, 102,748.

**Surface, Rivers, &c.**—The whole county is hilly, but the hills seem as if scattered in an irregular manner, without forming continued ridges or chains. The principal heights are the Slieve Beagh Mountains, in the north, which define in that part the basin of the Blackwater; and those in the east, which rise about the sources of the Fane, and are connected with the Fews Mountains of Armagh; Mully Ash Hill, in this group, is 1035 feet high. The Slieve Beagh Mountains form an uninteresting waste along the boundary of this county and Tyrone. The highest point is 1254 feet above high sea-level. There are many bogs, and the lakes and rivers are numerous, but small; the North Blackwater, which falls into Lough Neagh, forms a part of the eastern boundary. The Ulster Canal passes through the county. Limestone of great variety and excellent quality is quarried; but the other minerals are few and

unimportant. The county is well supplied with good roads, and is connected by railway with Dublin, Belfast, and Galway, and directly with the coast at Dundalk.

**Soil, Agriculture, Manufactures.**—The soil of the county varies much, but the variation is partly dependent on the character of the surface; the low lands being generally wet and moory, especially in the north-western parts near the Slieve Beagh Mountains. The central districts are more fertile than any other part of the county, although the southern extremity also consists of productive land. The western side has a soil naturally wet, but capable of great improvement by draining and manuring. The more hilly parts are a stiff clay, good for flax and corn, but very difficult to work. The climate generally is very humid. The occupations are almost wholly agricultural, and spade husbandry is much practised. The main crops are oats, barley, potatoes, and flax, which latter, from its improved culture, is vastly increasing, both in quantity and in value; the culture of wheat and of green crops is increasing. The cultivation of flax is steadily pursued, and the only manufacture is that of linen. The county returns two members to the House of Commons.

**History.**—This portion of Ireland was bestowed on De Courcy by Henry II. in 1177, but from that period till the time of Henry V. the chieftains of the MacMahon family were almost constantly at issue with the English. Little is known of the subsequent condition of the district, or the events that occurred in it, until the reign of Elizabeth, when the MacMahons were finally put down, and their estates confiscated.

**MONAGHAN**, the county town, is 76 miles N.N.W. from Dublin. The town consists of a central square, and three principal streets diverging from it. It contains a county court-house, county gaol, infantry barracks, county infirmary, market-house, a handsome church, Roman Catholic cathedral and college, and chapels for Presbyterians, Methodists, and Independents. In 1878 a monument to the memory of Lord Rossmore, who was killed in a steeplechase at Windsor in 1874, was erected in the town. There are some linen manufactures. The Ulster Canal passes close to the town, and it is situated on the great north line of railway from Dublin to Londonderry. Population in 1881, 8369.

**MONARCHY** (from the Greek *monarchia*, a word compounded of *monos*, alone, and *archein*, to govern, and signifying the government of a single person). The appellation of *monarch* properly implies the possession of the entire sovereign power by the person to whom it is affixed. The title of *king*, on the other hand, does not imply that the king possesses the entire sovereign power. In a state where the king once was a monarch, the kingly office may cease to confer the undivided sovereignty. States which were at one time governed by kings possessing the entire sovereign power, and in which the king has subsequently been compelled to share the sovereign power with a popular body, are usually styled *mixed monarchies* or *limited monarchies*; and what has been here called a *true monarchy* is now usually called an *autocracy* or a *despotism*.

Governments are sometimes divided into *monarchies* and *republics*, and therefore all governments which are not monarchies are republics. These definitions of *monarchy* and *republic*, however, do not agree with existing usage; according to which, the popular though royal government of England, for example, is a limited monarchy, and not a republic. England, indeed, is happy enough to enjoy the blessings of both systems without their evils.

**MONASTERY.** See MONASTICISM.

**MONASTICISM** (Gr. *monos*, alone; *monachos*, solitary), a term used in ecclesiastical history to designate the tendency and condition of all persons who, for purposes of self-discipline or the more efficient service of the church and

benefit of Christian society, live either as hermits or in a community under a superior. The ideal of a life of spiritual perfection above the common, to be attained by seclusion and severe self-discipline, was well known to Asiatic nations before the Christian era. The Essenes among the Jews, in the age immediately before Christ, withdrew from the bustle and corruption of cities, and lived together in remote villages, renouncing the joys of married life, devoted to fasting, prayer, and long vigils. In Egypt, where there was at that time a large Hebrew population, the Therapeutæ professed a similar pursuit of spiritual perfection, and lived under a like discipline. In the early Christian societies of the East and West this tendency toward attaining a higher moral excellence by self-denial and some degree of seclusion, manifested itself in the Ascetæ (Gr. *asked*, I exercise). Christian asceticism, however, from the very beginning differed widely from the principles and methods of the self-chastising sects of Persia and India. These regarded matter and the flesh as essentially impure, and aimed, in their self-inflicted rigors, at purifying the soul from the stains contracted by union with the body. Christianity holds all God's creatures to be pure, while urging man to rise by self-denial and self-sacrifice to a closer resemblance to Christ. The Ascetæ practised voluntary poverty and chastity without quitting their homes, abstaining only from joining in public amusements or social enjoyments. Monachism, in its first form, that of eremitical life, soon verging into monastic, or that of many hermits living close to each other in an assemblage of cells called a monastery, appeared in the person of St. Antony of Egypt (250-356). The persecutions against the Christians made him, in 270, fly into solitude, where he led a hermit's life. The fame of his holiness attracted many disciples, who built cells near his own, and submitted to his instruction. At his death these aggregations of cells, in imitation of Antony's first monastery, were multiplied over Egypt. St. Pachomius, a disciple of Antony, in the latter's lifetime (315) gave a more definite form and a great extension to these monasteries, which filled the Thebaid, the depopulated region surrounding Egyptian Thebes.

The solitaries composing each cluster of cells or monastery were by Pachomius brought together for daily divine service, or for instruction in common. As they all subsisted by the work of their hands, some of the brethren were commissioned in turns by the superior to sell the produce of their labour in the nearest city, and purchase the needful provisions and clothing. This beneficent authority of Pachomius and Antony extended over other monasteries. As time went on these monasteries were given the disposition most suitable for the half-solitary, half-cenobitic life which the members led. They resembled villages with a single street, and were thenceforth in the East called *lauras* (Gr. *laura*, a lane). The single lane soon became multiple, the monasteries increasing in fame and numbers, till some of these voluntary associations counted 10,000 monks and upwards under one superior or abbot. They divided their time between meditation on heavenly things, prayer, study of the Scriptures, writing, and manual labour. A generous provision was always made for the poor and the exercise of hospitality, a *xenodochium* or strangers' house being attached to each monastery. Such was monasticism in Egypt as described by St. Athanasius in his writings, particularly in his "Life of St. Antony." Athanasius, during his exile in Italy, contributed toward its introduction and spread in that peninsula and the rest of Western Europe. It had already taken root in Arabia, Palestine, Syria, and Asia Minor. St. Ambrose popularized it in Milan and Northern Italy. From Milan St. Martin of Tours brought it with him into Gaul, and St. Augustine of Hippo into Africa. St. Honoratus, in the island of Lerina, governed in the fifth century 10,000 monks, who cultivated sacred and profane knowledge as well as self-discipline. From Lerius

and St. Martin's monasteries on the Loire, St. Patrick borrowed the monastic forms which he planted in Ireland, and which passed thence into Iona, Scotland, England, and Wales. Columbanus founded monasteries in the Frankish kingdoms of Gaul, on the shores of Lake Constance, and at Bobbio, in Lombardic Italy. The monastic movement, in this its first stage, was not confined to one sex. When St. Antony was retiring into the Thebaid in 270 he placed his sister in a house of virgins (Gr. *parthenon*), as Athanasius relates, where he found her many years afterwards leading a holy life, and governing a community of women devoted, like herself, to the virgin life. In Italy St. Ambrose encouraged his own sister Marcellina to enter a similar community, and wrote for her and their direction his treatise on virginity. St. Jerome propagated among the Roman ladies their love of a monastic life. Several of the most noble of them, like Paula and her daughter Eustochium, followed him to Bethlehem, and founded there a monastery for women. The same spirit was fostered among the ladies of Pontus and Bithynia by St. Basil and the Gregories, as well as by St. John Chrysostom in Antioch and Constantinople. While monachism, or the tendency to retirement from the world, prompted so many to embrace what is technically called the solitary or contemplative life, a parallel tendency impelled the clergy, for their own self-sanctification and the more effective discharge of their ministry, to live together in common near the cathedral and parish churches. This was the origin of what is known in history as the Canons Regular, a vast portion of the clergy in the early and later mediæval times; indeed this also led afterwards to the rise of that great division of the religious or monastic orders known as Regular Clerks and Congregations, as distinguished from the monks and friars. At first the clergy of the principal churches were inscribed on a "list" (Gr. *kanon*); and this caused them to be called even in Rome, where the Greek language then prevailed, *canonici*—the clerics regularly belonging to the church. St. Ambrose in Milan encouraged among his clergy the tendency toward living in the same house with a common table, a common purse, and a distinctive dress, and following some sort of a common rule. St. Simplician, who was the friend, helpmate, and successor of Ambrose, lived with other priests and clerics in this manner, and to this model priests' house St. Augustine withdrew for a space after his baptism. When he became bishop of Hippo he endeavoured to have his priests live with him after the same fashion. This, not improbably, was the reason why in the tenth and eleventh centuries the Canons Regular professed to follow the rule of St. Augustine.

The second phase of monasticism in Western Europe dates from the foundation of the monastery of Monte Cassino, in 529, by St. Benedict. His rule soon superseded all over the West those of preceding founders, such as St. Columbanus. He did away with the ill-regulated austerities, the repetitions of vocal prayer, and the wavering discipline characteristic of the then existing monastic houses. He regulated with a wisdom founded on a thorough knowledge of human nature the active powers of mind and body. The daily solemn celebration of the liturgy and the chanting in common of the divine office were reduced to edifying uniformity. The time of the monks was so well ordered that no place was left for idleness, while the talents and tastes of each were most usefully directed and their strength husbanded. Field labour, the study and teaching of sacred and secular science, the composition of original works, the copying and preservation of ancient masterpieces, made of Monte Cassino a bee-hive. Destroyed by the Lombards during the pontificate of St. Gregory the Great (590-604), this religious community was transferred for a time to St. Andrea of Rome, whence Gregory sent the monk Augustine and his companions to the court of the Anglo-Saxon Ethelbert. Benedictine monasteries multi-

plied prodigiously, the monks becoming the apostles of all the countries of North-western Europe. Maur, a disciple of Benedict, founded his first establishment at Glanfeuil, near Angers, and this became the parent-stem of the Benedictine monasteries in Gaul. The Benedictines were called to Spain in 688. The feudal princes and nobles everywhere contributed generously to the foundation and endowment of the Benedictine houses. Unhappily, as these houses acquired popularity, influence, and power, the feudal benefactors claimed patronage over them; they sought to place in the abbot's chair, as they did in the bishop's seat in the neighbouring city, either a scion of their own family or a sworn dependant. This intrusion, and the very wealth and political power which attached to the abbot's place, together with the long battle about investitures, impaired the religious spirit in many, or most, of the great monasteries. From the end of the ninth century onwards, successive efforts were made by men within the Benedictine communities to restore the severity of the original discipline and the fervour and purity of the primitive monks. Thus the great Benedictine monastery of Cluny, founded in 912, endowed by William, duke of Aquitaine, with all his domains, forests, meadows, and vineyards, rose to such a pitch of power that it wielded jurisdiction over hundreds of monasteries. Governed at first by a succession of saintly abbots, it fell into moral decadence by its very wealth and power. It was reformed by Peter the Venerable at the beginning of the twelfth century, when 2000 convents were affiliated to Cluny. St. Romuald, in 1010, established at Camaldoli, in Tuscany, another reform, which became an independent branch of the Benedictines. He aimed to engraft on the rule of St. Benedict the half-eremitic, half-eremitic life of the Thebaid. The Camaldolese monasteries, wherever they exist, strikingly remind us of the Egyptian lauras. The Carthusians, founded by St. Bruno at La Grande Chartreuse, near Grenoble, toward the close of the same century, was an effort in the same direction, and aimed at realizing the same ideal. It is of all the monastic organizations then existing or boasting a contemporaneous origin, the only one which has never called for a reformation. In 1098 St. Robert founded at Cîteaux (*Lat. cistercium*), near Dijon, a monastery, in which he intended that the primitive rule of St. Benedict should be observed in all its rigour. This also became an independent branch of the Benedictine tree; its numerous offshoots, with Clairvaux and its dependencies, forming the Cistercian order. Indeed it was the rise, within the Benedictine family, of the numerous and powerful houses of Camaldoli, Carthusians, and Cistercians, which occasioned the use of the term Religious Orders. While the monastic family of St. Benedict, composed of monks properly so-called, and professing principally a life of active solitude far, far away from the busy world, was undergoing these vicissitudes, the Canons Regular and all that portion of the parochial clergy who submitted to common life and a rule, were also subject to like changes. Bishop Chrodegang of Metz, in the eighth century, endeavoured to organize all his clergy into a body subject to a common rule and living together in communities, so as to afford the people brighter examples of abnegation. He thus succeeded in uniting the clergy of his cathedral, who put their property in common, were contented with receiving from this fund the necessities of life, and sang the divine offices in choir, after the manner of monks. Other cathedral and leading churches followed this example, and thus arose what are known to us as chapters, collegiate churches, and canons. But this reform was not of long duration. In 1119 St. Norbert, seeing the great good effected by the reforms of Cîteaux, Camaldoli, and La Grande Chartreuse, was inspired to found at Prémontré, in the forest of Coucy, near Laon, a house of reformed Augustinian canons, who observed a perpetual fasting and abstinence from flesh meat. This

reform became so popular that it counted at one time a thousand abbeys, acknowledging the jurisdiction of Prémontré. In England, at the accession of Henry VIII., the order possessed thirty-five houses.

The third phase of monasticism begins with the rise of the Mendicant Orders, the Franciscans, Dominicans, Carmelites, Augustinian Hermits, and Servites in the thirteenth century. Francis of Assisi, Bernard of Quintavalle, a rich merchant of the same city, and Peter of Catana, a canon of the cathedral, united together in 1209 to lead a life of the most perfect evangelical poverty while labouring among the poor. Their object was, following closely in the footsteps of Christ, to restore among the oppressed populations of Christendom especially, as well as among all classes of society, the love and practice of gospel morality as our Lord intended it.

The Dominicans or Friars-preachers, founded in 1215, laboured in Italy and all over Western Europe side by side with the Franciscans, the former aiming principally at instructing the people in the Christian doctrine. This feature of their religious life led them to cultivate in a special manner theology as well as secular knowledge, both indispensable or necessary to the preacher. The Franciscans, on account of the beautiful life of their founder, and of their identifying themselves with the masses in city and country, acquired an immense popularity and extension. But during the lifetime of the founder a portion of his followers refused to accept his interpretation and practice of evangelical poverty, thereby incurring to a great extent the reform in life and manners such examples as his were producing everywhere. From the thirteenth to the sixteenth century the high ideals at first pursued by the mendicant orders were gradually lost sight of by a large proportion of their numbers, but not without energetic and successful protestations and attempts to restore the primitive discipline of the respective founders. This spirit of reaction against worldliness in the cloister showed itself chiefly among the Franciscans and Carmelites, the former having no less than four distinct branches vying with each other in the strict observance of the primitive law of poverty—the reform of St. Bernardine of Siena (1419); the Recollects, founded in 1500 by John of Guadalupe; the Alcantarines, founded in 1555 by St. Peter of Alcantara; and the Capuchins, dating from 1526. The Carmelites, who aimed at copying the half-eremitical, half-active life of the ancient Egyptian and Palestinian monasteries, were banished from the Holy Land by the victorious Saracens, took refuge in Cyprus and England in 1238, and acquired rapid celebrity and extension. The great papal schism of Avignon had a fatal influence on the Carmelites, as on many of the great religious orders. Division produced indiscipline and relaxation. An energetic and thorough reform was introduced among the Carmelites by St. Teresa (died 1582).

The fourth phase of monasticism dates from the sixteenth century and the Council of Trent. The alarm caused to Catholics by the spread of the Reformation compelled all earnest men among them to seek out and correct the abuses and corruption which had crept into Christian society, and even into the cloister and the sanctuary. Long before the appearance of Luther on the scene numbers of holy men and women had been labouring by voice and example to withstand the tide of licentiousness, ever rising higher in European nations, as well as the indiscipline, laxity, and corruption which were the bane of religious life, and tainted a part of the clergy, both regular and secular. The Minims Hermits of Francis of Paola, founded in Calabria in 1444, the Theatines (1524), the Capuchins (1526), the Barnabites (1533), the Clerks Regular of Somasca (1580), the Company of Jesus or Jesuits (1540), sprang from this spirit of reaction against the laxity of the cloister and corruption of secular manners. Contemporaneously with these new offshoots of

monasticism arose the first great order of women devoted to education—the Ursulines, founded at Brescia in 1532—and which soon spread over all Europe, and even sent colonies of nuns to North and South America. The Clerks Regular of the Pious Schools, in emulation of the Jesuits and the Ursulines, sprang up in 1617 under St. Joseph Casalana, a Spaniard. The Oratorians, founded in Rome by St. Philip Neri in 1564, aimed at fostering enlightened and solid Christian piety among men of the world; the French Oratorians were instituted for a like purpose. The Lazarists (also called Fathers of the Mission and Vincentians) were founded by St. Vincent de Paul in 1625, for the purpose of raising the standard of piety among the parochial clergy, of instructing the poor country folk, and labouring among the heathen abroad. The Sulpicians (1642) and the Eudists (1643) were instituted for the education of the clergy. The Sisters of Charity, also founded by St. Vincent de Paul, undertook hospital work, the care of foundlings, orphan asylums, and the education of poor children generally, while the Visitation Nuns, or Salesians, founded by St. Francis of Sales, combined a cloistered life with the education of young ladies. The tendency became universal towards encouraging, exclusively or principally, orders of both men and women devoted either to education, the laborious duties of missionary work at home and abroad, or the care of the sick, infirm, aged, and poor. Even the latest and most rigorous reform introduced among the Cistercians, that of La Trappe (1664), found favour in public opinion, not only from the austerity of the life led by the Trappists, but from the great services rendered by them to agriculture. In Africa they have charge of orphanages and agricultural schools; in Ireland, at Mellera, besides a model farm, they also have a flourishing school. Near Rome they are reclaiming the malarious Campagna by drainage and large plantations of eucalyptus. This modern tendency of religious orders to combine the most beneficial labours with strict self-discipline has given rise to a very large number of brotherhoods and sisterhoods, devoted chiefly to education and charity, or to both.

The last phase of monasticism dates from the change introduced by Pius IX. into the constitution and training of all but a few religious orders, changes based upon the strong religious and intellectual formation and the protracted probation in use among the Jesuits before their members are admitted to the final vows of their profession.

In the preceding historical summary no special mention has been made of the military orders, of the mediæval Hospitallers, or of the numerous lay affiliations to the great monastic bodies, known in church history as Tertiaries or Third Orders. The terrible prevalence of leprosy in the East, and its spread during the middle ages throughout most European countries, were met by the foundation everywhere of leprosy hospitals, in which men and women of the highest nobility devoted themselves by the solemn vows of religion to the exclusive care of the plague-stricken. In France there were several leprosy hospitals, generally bearing the name of St. Lazarus, which were served by none but persons of royal or noble birth, who besides the ordinary monastic vows, bound themselves by a special vow to serve lepers all their life. St. Francis of Assisi and his early followers had a predilection for the afflicted of this class. The orders of St. John of Jerusalem and the German Knights Hospitallers of St. Lazarus had their origin in their devotion to the care of the sick pilgrims and the plague-stricken in Palestine, the latter taking special charge of lepers. The Hospitallers, being for the most part knights or gentlemen, were soon induced or compelled by local necessity to defend the Christian colonies against the Moslem. This military side of their vocation was exclusively that of the Templars. The desire to redeem from slavery the numerous Christian captives carried off

by the Moslems in their wars gave occasion to the foundation in 1198 of the Trinitarians, who made a special vow to purchase the freedom of Christian slaves, or, ransom failing, to remain slaves in their stead. They counted at the time 250 houses. In 1218 the Order of Mercy was founded at Barcelona by Jaime I., and St. Peter Nolasco. A priest of this order, Father Solorzano, was almoner of Columbus' fleet in 1492, and the first missionary to the New World. In Spain the Knights of Santiago were founded to give hospitality to the numerous pilgrims to Compostella, and to protect them going and coming among the Moors; the Knights of Calatrava, founded in 1158, and those of Alcantara, in 1178, were instituted for this latter purpose. The Knights of the Glorious Virgin Mary—the Frati Godenti, culminated by Dante and vindicated by his descendant, Count Gozzadini—were founded at Bologna in 1265 to restore harmony among the warring cities of Italy, and to protect the weak. They rendered great services, and had houses in nearly all the principal republics. The Order of the Sword, founded in Northern Germany in 1202, was merged later into that of the Teutonic Knights, who subdued the heathen of East Prussia, and acquired sovereign rights over the country. The Franciscans from the beginning, besides the Friars or First Order, who were bound by the three vows of poverty, chastity, and obedience, admitted a Second Order of Nuns, the Poor Clares, bound by the same vows and strict inclosure. A Third Order arose out of men and women living in the world, who voluntarily practised poverty, devoting their wealth to the relief of the poor or the foundation of hospitals. Some also practised voluntary chastity while living in their own homes, meeting occasionally together for devotional exercises. These Franciscan Tertiaries numbered 150,000 during the life of St. Francis, and counted among their members emperors, kings, queens, and persons of all classes. The Dominicans, Carmelites, and Servites had also, besides the monks and nuns, a third order, of persons living in the world. The pursuit of a higher ideal of personal perfection, on which monasticism is founded, was seriously interfered with by the Reformation in the sixteenth century, and by the French Revolution and the scepticism of the eighteenth. In the nineteenth, at one time, there was a great revival in France itself of the monastic spirit, while as this is written a reaction of stern repression against monastic bodies and clerical influence distinguishes both France and the Italian and Spanish peninsulas. In the English-speaking world a deeper sense of civil and religious liberty encourages the pursuit of self-sanctification and devotion to the good of others, and respects the right of individual conscience to seek and follow what is thought to be the better way.

**MON' AUL.** See IMPRYAN PHEASANT.

**MONBOD'DO, JAMES BURNETT**, styled **LORD** (in his quality of one of the judges of the Court of Session), was born in 1714, at the family seat of Monboddoo, in Kincardineshire, and after studying at Aberdeen was sent to the University of Groningen. He returned home in 1738, and from that time practised as an advocate at the Scottish bar, till his elevation to the bench in 1767. He is known in the literary world by two learned but paradoxical works; the first entitled "A Dissertation on the Origin and Progress of Language;" the second, "Ancient Metaphysics." He is also remembered for his curious theory that man was descended from the race of Simim or Apes, whose tails had gradually been worn off by their adoption, during countless generations, of a sitting posture. He died at Edinburgh, 26th May, 1799.

**MONCRIEFF GUN-CARRIAGE.** See ARTILLERY.

**MONETARY CONVENTIONS.** See INTERNATIONAL COINAGE.

**MONEY** (Bullion). Not very long since the belief prevailed that wealth consisted solely of money, or of the

precious metals, which, when not already in the state of money, are capable of being directly converted into it. It was thus assumed that whatever tended to heap up money or bullion in a country added to its wealth. If a nation possessed no gold or silver mines, the only industry by which it could be enriched was held to be foreign trade, being the only one which could bring in money. The commerce of the world was looked upon as a struggle among nations—which could draw to itself the largest share of the gold and silver in existence. These ideas gave a false direction to the policy of nations. The great political economist, Adam Smith, was the first to demonstrate that they are founded in error.

The wealth of a country consists of all those things which serve any human purpose, and which nature does not afford gratuitously. To be wealthy is to have a large stock of useful articles, or the means of purchasing them. Everything, therefore, for which anything useful or agreeable would be given in exchange, forms a part of wealth.

Now money, although not synonymous with wealth, is yet rightly regarded as a part of wealth, because it is the instrument of an important public and private purpose. The question is—What is that purpose? Why is money a desirable possession to a country?

The use of money consists in its being a convenient means for facilitating the distribution of industry.

In the first place, it is a common measure for values of different sorts. If a tailor had only coats and wanted to buy bread or a horse, it would be very troublesome to ascertain how much bread he ought to obtain for a coat, or how many coats he should give for a horse. Whereas, now, each thing has a current price in money. As it is much easier to compare different lengths by expressing them in a common language of feet and inches, so it is much easier to compare values by means of a common language of pounds, shillings, and pence. A still greater advantage in the use of money is, that it does away with all the inconveniences of barter, and facilitates the division of employments. A tailor having nothing but coats might starve before he could find any person having bread to sell who wanted a coat; besides he would not want as much bread at a time as would be worth a coat, and the coat could not be divided. Consequently every one would be obliged to sell his commodities in exchange for anything which, being easily divisible, generally desired, and not liable to deterioration by keeping, would enable him to keep a stock of it for making purchases. Very few articles possess these necessary qualifications; and almost all nations, at a very early period, fixed upon certain metals, and especially gold and silver, to serve this purpose. These were the things which it pleased every one to possess, and which there was most certainty of finding others willing to receive in exchange for any kind of produce. They were among the most imperishable of all substances. Beyond these qualities another unfolded itself by degrees. Of all commodities gold and silver are among the least influenced by any of the causes which produce fluctuations of value.

When the precious metals had become virtually a medium of exchange, the contrivance of coining obviously suggested itself. The mere introduction of a particular mode of exchange, by first exchanging a thing for money, and then exchanging money for something else, makes no difference in the essential character of the transactions. It is not with money that things are really purchased. Nobody's income (except that of the gold and silver miner) is derived from the precious metals. Money is merely a machine for doing quickly and commodiously what would be done, though less quickly and commodiously, without it. The difference between a country with money, and a country altogether without it, would be only one of convenience, and to mistake money for wealth is like mistaking the

road which may be the easiest way of getting to a house and lands, for the house and lands themselves.

Neither must money be confounded with capital. Before anything is money, it must be such that we can go into the market and immediately use it in the purchase of commodities or payment of debts. Materials, machinery, &c., so long as they are in full use, are capital, but are not money.

Gold and silver are articles of mere merchandise, whether in a raw or manufactured form—that is, as dust, ingots, bullion, or coin—when they are re-exported from countries which merely receive them for the purpose of distributing them. They are still articles of mere merchandise when they are imported for use in the arts, as for gold and silver plate, or for decoration, whether of furniture or of the person, or in any other way than that of currency. They are still articles of mere merchandise when they are exported in the shape of coin to satisfy obligations created in foreign countries.

In transactions between nation and nation, except in cases where gold and silver are the natural products of a country, they are rarely used, the imports and exports of the nation as a rule balancing each other, and the influx and efflux of specie out of or into any one country being determined by causes similar to those which govern the distribution of other products. Nor are all the transactions between the inhabitants of any one country settled by the machinery of the precious metals. The result may be effected by their substitutes. Thus, for example, transactions representing an average of £20,000,000 sterling are daily adjusted in one room in London, the bankers' clearing-house, without the intervention of a sovereign, a shilling, or even a penny. In the absence of these substitutes for the precious metals, the adjustment of these mutual obligations would be so inconvenient as to be practically impossible. Convenience as well as economy induces a community to dispense as far as possible with the machinery of a metallic currency. Every one of these obligations is expressed in quantities of the precious metals. But the business done in three ordinary days at the clearing-house represents more specie than is to be found in all the reserves of all the banks in London. Even if these were the only transactions in which substitutes are found for money, the specie possessed by the London banks would be made to operate as the machinery of trade more than a hundred times a year.

A country, then, supplies itself with such gold and silver as it needs for the arts, in the same way that it supplies itself with other raw materials, by the exchange of its exports. In the same way it obtains such sums of the precious metals as it needs for the purposes of ordinary retail trade and exchange. The amount which it retains of these metals is increased as its home trade increases, but is diminished by economies in the substitution of symbols for coin. Thus the general use of cheques has tended to diminish the amount of specie circulation in a country, and were one-pound notes adopted in England, as in Scotland and Ireland, a further economy would ensue, in so far as such notes, when put in circulation, represented a larger sum than might be retained by the bank which issued them and was bound to exchange them on demand for gold. There is reason to believe, then, that the amount of specie circulating within a country varies little from year to year; for there is no motive to increase its amount, and every motive to reduce it to the least possible quantity consistent with the fulfilment of those functions for which money is adopted as a measure of value. It is possible that at the beginning of the present century there was nearly as much metallic money in England as there now is; for although the population has more than doubled, and the wealth of the country has grown in a far greater proportion, it is very likely that the enlarged demand for

money is compensated by the increased use of banking and drawing facilities, and the abandonment of the habit of hoarding, a practice which was very general sixty and seventy years ago.

The ordinary supply, then, of gold and silver, in so far as it is employed in the arts, and employed for the purposes of an internal currency, is effected in the same way as that by which other wants are satisfied. It does not seem that these quantities of the precious metals can be materially diminished, just as they will not be materially increased. There may be, as there was during the great continental war, a demand for specie in order to pay troops; and if paper can be substituted for gold and silver, a drain upon the metallic circulation may take place. In the absence of such a substitute but little of these metals will pass out of the home circulation. Dealers in the precious metals find it possible to trench on other resources, the amount of which is far less than that in circulation, but which is far more open to these influences. Gold and silver will hardly be extracted from circulation, except in some slight degree, and usually by offering a premium on them in the shape of imports at a reduced price. But persons who need to export money can obviously procure gold in exchange for notes, and thus by contracting the proper circulation, and thereupon by putting an additional strain on the metallic currency, render any effect on the latter increasingly remote and difficult.

A paper circulation purports to give the holder of the note a right to demand the sum specified in the note at his pleasure. Under no other circumstances will paper circulate at par, i.e. be exchanged at the sum which it represents. If the paper has a forced currency, it will circulate only because the solvency and good faith of the issuing parties is trusted; if it be suspected, or the prospect of redeeming the note be distant, it will circulate at a depreciated rate, this rate appearing in the country which uses the note in a rise in prices, and in transactions with foreign countries in an adverse state of the exchange. For example, the par of exchange, omitting fractions, between England and France is twenty-five francs to the £1. If, however, French notes were inconvertible and had a forced circulation, and the suspicion or risk attending on the use of the paper amounting to 20 per cent., the prices of articles purchased in the French market would rise by this or more than this amount, and it would take thirty-one francs, speaking roundly, in paper to procure an English sovereign. This rise in the value of gold, or, to be more exact, fall in the value of inconvertible paper, was specially manifested in the currency of the United States during the civil war. The discredit attaching to this paper at one period was so considerable that it took 280 paper dollars to procure 100 gold ones. But with the return of peace, and with an abundant revenue, the government was able to grapple with its public debt and its state paper, and now that the paper currency can be exchanged at pleasure for gold or silver it circulates at par.

The most remarkable instance of the depreciation of paper money is given in the article on the *MANDATS* of the first French republic.

Banks of issue find it possible to circulate a far larger amount of paper than the gold on which the paper is based. A bank, for example, may in ordinary times circulate £30,000,000 of notes, and be quite safe from risk if it retains only £10,000,000 of specie, i.e. has its metallic assets only one-third of its liabilities. It takes care, of course, if it is dealing honestly with those who use its notes, that the remainder of its liabilities are covered by property, i.e. by bills of exchange arriving at maturity, or by quantities of government securities. A very valuable work on this subject is "*Money, and the Mechanism of Exchange*," by Professor Jevons, London, 1875.

**MONEY** (Currency) is metal coined for the purposes of commerce, usually stamped with the name and arms of the prince or state that directs it to pass current. In a more enlarged sense, money means any representation of property, whether in coin or in the form of paper—the currency or circulating medium. For general illustrations of our monetary system, the reader may refer to such articles as *BANK*, *BILL OF EXCHANGE*, *COIN*, *EXCHANGE*, and *INTEREST*.

*Currency* differs from the word *money*, in so far as it expresses only that which passes as money at some time or place referred to.

A gold currency is a very expensive one, and therefore numerous methods have been devised for superseding it by something cheaper. Unless, however, law or custom intervenes to give it efficiency, this cheaper material will only be worth its own intrinsic value. Thus a five-pound Bank of England note is intrinsically worth a few pence. It derives its value as currency or money from the obligation it fixes on a rich corporation to make good its proffered amount to the holder.

A currency which is not bullion, and is not worth its nominal value in coin or bullion, is called a "depreciated currency." A depreciated currency, however, is useful for small transactions. In twenty shillings there is not as much silver as is really worth a sovereign, and in the same way 240 pence, which are as money equal to a sovereign, only make a small percentage of it in value as merchandise. To prevent incidental abuses arising from an over-valuation of silver coin, the legislature keeps down the quantity of silver coinage to the amount supposed to be required for small payments, and limits the extent to which silver is a legal tender at forty shillings, and bronze at twelve pence.

In the enumeration which follows we give the coins most in use at present in various parts of the world, with their English values. It is necessary, however, to add that the gold coins are taken at their *actual* and the silver coins at their *nominal* value. Several of the countries mentioned have in addition an inconvertible paper currency, which circulates at a reduced value. In Europe Austria, Russia, Greece, and Turkey have all issued an inconvertible paper currency, the nominal value of which fluctuates in accordance with the financial condition of the country, and the same must be said of the Argentine Republic, Brazil, Chili, and Peru in South America, and of Japan in Asia. In British India the gold coins circulate as "commercial money," i.e. their value is computed according to the amount of the precious metal they contain, and not in accordance with their nominal value in rupees. The standard money of British India is the silver rupee, which, though nominally worth 2s., has for many years maintained only a fluctuating value, generally about 1s. 8d. In the Cape of Good Hope and the Australasian colonies the coins in circulation are exclusively British, with the exception of those struck at the Australian mints. At the Cape all public accounts are kept in pounds, shillings, and pence, but many private persons still adhere to the old mode of reckoning in rixdollars, skillings, and stivers, the British equivalents of which are—the rixdollar of eight skillings = 1s. 6d.; guildor = 6d.; skillings of six stivers = 2½d. In Egypt the coins of Turkey are a legal tender, but those most in use are such as have been brought into the country from the various European nations and Spanish and Mexican dollars. English sovereigns and French twenty-franc pieces also circulate freely in Turkey. The French coinage was accepted as the standard system by the "Latin Union," or the countries of Belgium, Italy, and Switzerland, in 1865, and it has since been extended to Spain, Greece, Roumania, and Servia. In this system the franc is taken as the unit, the coin of corresponding value being called the *lira* in Italy, *peseta* in Spain, *drachma* in Greece, *lei* in Roumania, and *dinar* in Servia.

## COINS MOST IN USE, WITH THEIR ENGLISH VALUES.

	Metal.	Approximate Value in English Money.		Approximate Value in English Money.
<b>AUSTRIA-HUNGARY.</b>			<b>MEXICO.—Continued.</b>	
100 krentzer=1 gulden.			1 dollar piece,	gold, £0 4 0½
8 gulden piece,	gold,	£0 15 10	1 " "	silver, 0 4 0½
4 " "	"	0 7 11	50 cent "	0 2 0
2 " "	silver,	0 3 11½	25 " "	0 1 0
1 " "	"	1 11½	<b>UNITED STATES. 100 cents=1 dollar.</b>	
20 krentzer		0 0 5½	20 dollar piece (double eagle),	gold, 4 2 6
10 " "		0 0 4½	10 " " (eagle),	2 1 8
<b>BELGIUM. See FRANCE.</b>			5 " "	1 0 7½
<b>DENMARK. 100 ore=1 krone.</b>			3 " "	0 12 4½
20 kroner piece,	gold,	1 2 1	2½ " "	0 10 4
10 " "	"	0 11 0½	1 " "	0 1 ½
2 " "	silver,	0 2 2½	1 " "	silver, 0 1 ½
1 krone,	"	0 1 1½	50 cent "	0 0 ½
50 ore piece,	"	0 0 6½	10 " "	0 0 5
40 " "	"	0 0 5½	5 " "	0 0 2½
25 " "	"	0 0 3½	3 " "	0 0 1½
10 " "	"	0 0 1½	<b>SOUTH AMERICA—ARGENTINE REPUBLIC.</b>	
<b>FRANCE. 100 centimes=1 franc.</b>			100 centimes=1 dollar or peso.	
20 franc piece,	gold,	0 15 10	20 peso piece,	gold, 4 1 8
10 " "	"	0 7 11	10 " "	" 2 0 10
5 " "	"	0 3 11½	5 " "	" 1 0 5
5 " "	silver,	0 3 11½	1 " "	silver, 0 4 1
2 " "	"	0 1 7	<b>BRAZIL. 1000 reis=1 milrei.</b>	
1 " "	"	0 0 9½	20 milrei piece,	gold, 3 4 10½
50 centime piece,	"	0 0 4½	10 " "	" 1 2 5
20 " "	"	0 0 2	2 " "	silver, 0 4 5
<b>GERMANY. 100 Pfennige=1 mark.</b>				0 2 2½
20 mark piece,	gold,	0 19 7	<b>CHILE. 100 centavos=1 peso.</b>	
10 " "	"	0 9 9½	10 peso piece,	gold, 1 17 6
5 " "	"	0 4 10½	5 " "	" 0 18 9
5 " "	silver,	0 4 11½	2 " "	" 6
2 " "	"	0 1 11½	1 " "	silver, 0 3 9
1 " "	"	0 0 11½	50 centavo piece,	0 1 10½
50 pfennig piece,	"	0 0 6	20 " "	" 0 0 9
20 " "	"	0 0 2½	10 " "	" 0 0 4½
<b>GREECE, ITALY. See FRANCE.</b>			5 " "	" 2
<b>NETHERLANDS. 100 cents=1 guilder.</b>			<b>STATES OF COLOMBIA.</b>	
10 guilder piece,	gold,	0 16 6	100 centavos=1 peso.	
5 " "	"	0 8 3	20 peso piece,	gold, 3 19 3½
2½ " "	silver,	0 4 2	10 " "	" 1 19 8
1 " "	"	0 1 8	5 " "	" 0 19 10
25 cent	"	0 0 10	2 " "	" 0 7 11½
10 " "	"	0 0 5	1 " "	silver, 0 3 11½
5 " "	"	0 0 2	50 centesimo piece,	0 0 9½
<b>NORWAY. See DENMARK.</b>			20 " "	" 0 0 5
<b>PORTUGAL. 1000 reis=1 milrei.</b>			10 " "	" 0 0 2½
Crown or 10 dollar,	gold,	2 4 5	<b>PERU. 100 centesimos=1 sol.</b>	
Half-crown or 5 dollar piece,	"	1 2 2½	20 sol piece,	gold, 3 19 3½
One-fifth or 2 " "	"	0 8 10	10 " "	" 1 19 8
One-tenth or 1 " "	"	0 4 5	5 " "	" 0 19 10
500 reis,	silver,	0 2 2½	2 " "	" 0 7 11½
200 " "	"	0 0 10½	1 " "	" 0 3 11½
100 " "	"	0 0 5½	1 " "	silver, 0 3 11½
50 " "	"	0 0 2½	50 centesimo piece,	0 1 11½
<b>ROUMANIA. See FRANCE.</b>			20 " "	" 0 0 4½
<b>RUSSIA. 100 copecks=1 rouble.</b>			10 " "	" 0 0 2½
10 rouble piece,	gold,	1 11 8	5 " "	" 0 0 2½
5 " "	"	0 15 10	<b>VENEZUELA. See COLOMBIA.</b>	
<b>SEVILLE, SPAIN. See FRANCE.</b>			<b>INDIA (British). 3 pie=1 pice; 4 pice</b>	
<b>SWEDEN. See DENMARK.</b>			=1 anna; 16 annas=1 rupee.	
<b>SWITZERLAND. See FRANCE.</b>			30 rupee piece (double Mohur),	gold, 2 18 4
<b>TURKEY. 100 piastres=1 medjidie.</b>			15 " " (Mohur),	" 1 9 2
Medjidie or lira (pound Turkish or L.T.)		0 18 0	10 " "	" 0 19 6
1 " "		0 9 0	5 " "	" 0 9 9
20 piastres,		0 4 6	1 " " (nominal value, 2s.),	silver, 0 1 8
10 " "		0 3 7	<b>JAPAN. 100 sen=1 yen.</b>	
5 " "		0 1 9½	20 yen piece,	gold,
2 " "		0 0 4	10 " "	
1 " "		0 0 2	5 " "	1 0
<b>NORTH AMERICA—BRITISH DOMINIONS.</b>			2 " "	0 8
No currency issued; English and United States' coins in circulation.			1 " "	0 4
<b>MEXICO. 100 cents=1 dollar.</b>			50 sen piece,	sil' 0 2
18 dollar piece,	gold,	3 4 9	20 " "	0 0 10
8 " "	"	1 12 4½	10 " "	0 0 5
4 " "	"	0 16 2½	5 " "	0 0 2½
		0 8 1	<b>CHINA. The Haikwan tael=10 mace=100 candareens=1000</b>	
			<b>cash=average rate of exchange, 5s. 10d., or 3½ Haikwan taels</b>	
			<b>to a pound sterling. There are no national gold and silver</b>	
			<b>coins in China, and foreign coins are looked upon but as</b>	
			<b>bullion, and usually taken by weight. Mexican dollars are</b>	
			<b>in most general use.</b>	



**MONGE, GASPARD**, was born at Beaune in 1746. His father was an innkeeper or hotel-keeper. The construction of a plan of his native town brought him under the notice of a colonel of engineers, who procured for him an appointment as draughtsman in the military engineering school of Mézières. In that capacity he soon gave proof of great abilities, and at the age of nineteen was appointed assistant to Boscuit, professor of mathematics, whom he accompanied to Paris in 1780 as joint professor of hydrodynamics at the Louvre. Monge was unrivalled in the communication of instruction, and in the interest which he could incite in the minds of his pupils. In 1780 he was elected a member of the Academy of Sciences, and in 1783 he succeeded Bezout as examiner of the naval aspirants. For his new pupils he wrote his treatise on statics. When the wars occasioned by the Revolution were on the point of breaking out Monge was appointed minister of marine. He quitted his post in the following year, and became busily engaged in the operations for the equipment of the army, especially the difficult task of creating manufactories of gunpowder, as France was thrown entirely on her own resources. He was an ardent patriot, but so far from a fanatic that he was more than once threatened with the guillotine, and might have perished had he been less necessary.

Monge accompanied Napoleon in the invasion of Italy, and was largely concerned in those wholesale robberies for which restitution was made in 1815. These, however, must be charged on the general; while to the commission, of which Monge was one, must be allotted the merit of having conveyed the pictures and statues carefully and safely to Paris. He also accompanied the expedition to Egypt; and to him, with Berthollet and Fourier, most of the scientific fruit of that undertaking is due, not only as the collectors, but even as the courageous defenders of what they had gained. During this expedition a strong friendship grew up between Monge and the future emperor, and Napoleon created him Count of Pelusium when he constituted his new imperial nobility. The great services of Monge to the empire (though he often opposed Napoleon's extreme views) led to his dismissal from all his offices on the restoration of the Bourbons. This, and the destruction of the École Polytechnique (since revived), are placed by Dupin among the causes of his death, which took place on 28th July, 1818. The great achievements of Monge were the production of a complete theory of statics, his creation of an entirely new geometrical method, the "descriptive geometry," which is of such infinite use in preparing intricate plans and elevations, and his fine improvements in the methods of Descartes' analysis as applied to geometrical problems. He founded the splendid mathematical school called the École Polytechnique, which long made French artillery and engineer officers superior to all the world besides.

**MONGHYR** (*Mungir*), the chief town and administrative headquarters of Monghyr district, Bengal, is situated on the south bank of the Ganges. It has been a place of considerable importance since the earliest days of the English occupation of Bengal, although it did not become a civil station until 1812. It consists of two distinct portions—the fort, within which are situated the public offices and residences of the Europeans; and the native town, stretching away from the former eastward and southward along the river. The fort is formed by a great rampart of earth inclosing a rocky eminence, which projects some distance into the Ganges, and is faced with stone. It was probably at one time a strong fortification. Towards the north the river comes up to the walls, forming a natural defence; to the landward a deep, wide ditch surrounds and protects the fort. On entering from the railway station by the Lal Darwaza or Red Gate, the principal entrance, Monghyr presents a very pretty appearance. The main road runs southwards between two large tanks, behind each of which

rise low hills. On one of these stands the Karna Chanra House, the property of the Maharajah of Vizianagaram; and on the other, a fine building known as the palace of the Shah Sahib, and now the residence of the collector, behind which is the residence of Shuja Shah, son of Akbar, which has been converted into a jail. Between the hills lie the government gardens, with trim hedges and neat wire-fencing. Beyond the gardens, and usually on low eminences, are the houses of the other Europeans. The total population is 60,000.

**MONGOLIA** comprehends a vast extent of country in the interior of Asia. Its length from east to west exceeds 1700 miles, and its greatest width from north to south 1000 miles. Its area is estimated at about 1,800,000 square miles. On the north it borders on Siberia, on the east on Manchuria, on the south on China Proper, and on the west on the Chinese province of Kan-su, and on the Chinese government of Thianshan Pelu.

The middle portion of Mongolia is occupied by the Great Gobi (Ta-Gobi). South-east of the Gobi extends a more elevated and uneven country, which terminates in a mountain range called Ho-lang Shan. Near 42° N. lat. it turns abruptly to the east, forming nearly a right angle, and it is then called Inshan by the Chinese, and Onglian Oûla by the Mongols; while another portion of it is called Khing-Khan Oûla. Some summits of this extensive range reach a height of 15,000 feet, far above the snow-line. The country which skirts this range along its western and northern base, and extends from it to a distance of between 50 and 100 miles, has a broken surface, the hills rising to some height above the valleys and small plains. South of the Inshan Mountains the country exhibits fertile valleys and mountains, partly wooded, as far west as the place where the Hoang-Ho River turns southward; this fertile tract is included in the Chinese provinces of Pe-tche-li and Shan-si. But the tract further west is covered with hills composed of loose sand, mostly without water and entirely destitute of trees. That part of Mongolia which is to the east of the Khing-Khan Oûla is called Kortashin. It is mostly a pasture ground, but some portions of it produce good grain.

The country which extends along the north-western side of the Ta-Gobi is very mountainous, and within it rise the rivers Selenga, Kerlon, and Onon. This country, which is rich when compared with other portions of Mongolia, belongs to the high-priest of the Buddhists, who resides in the neighbourhood of the town of Urga, and is called Kootokhtu. It forms a separate government of the Chinese Empire, and its general governor, called *vang* or *kiun-vang*, as well as the lieutenant, called *amban*, resides in the town of Urga or Oergo. The population of this town does not exceed 7000, of which one-fifth are said to be lamas, or persons belonging to the ecclesiastical establishment of the Kootokhtu; but it is a place of considerable traffic.

As the whole surface of Mongolia, with the exception of the deep depression of the Ta-Gobi, is more than 8000 feet elevated above the sea-level, and as it stretches out in vast plains, to which the comparatively low ranges of mountains along its northern border cannot afford shelter against the northern and north-eastern winds, the climate is much colder than in that part of Siberia which extends along the base of the Altai range west of Lake Baikal.

The wealth of the Mongols consists in their numerous herds of camels, horses, and sheep. Cattle are only numerous on the more hilly tracts. Asses and mules are only found in the vicinity of China. Wild animals are numerous, especially hares, antelopes, djiggetais or wild asses, deer, foxes, sables, squirrels, and marmots. Water-fowl are plentiful on the numerous lakes and swampy tracts. In some places the desert is covered with small stones, from among which several kinds of precious stones, as chalcodony, agate, onyx, jade, cornelian, &c., are collected by the Chinese.



*Inhabitants.*—The population may be estimated at about 4,500,000, of whom 2,000,000 are Mongols, the remainder consisting of Chinese settlers in the south-east and south, Kirghiz, Uriankhai (or Soyot), Manchu, Chinese and others in Dzungaria or Western Mongolia. The Mongols are divided into two great divisions, the Eastern or Proper Mongols, and the Western Mongols or Kalmucks. The Proper Mongols are divided into three great nations, the Tshakhar, Khalkhas, and Sunnit, which occupy different districts, but all submitted to the Chinese or Manchu power during the seventeenth century. The whole nation is divided into twenty-six tribes, called *almak*. Each of these divisions has a hereditary prince, except the Khalkhas, who constitute one *almak*, but are governed by four hereditary princes, called *khans*. All four claim a descent from Genghis Khan. The Manchus have introduced among themselves a military division, according to which the whole nation forms 135 banners, each of which is subdivided into regiments and companies. Each Mongol is bound to serve as a horseman from his eighteenth to his sixtieth year. The Mongols are Buddhists, and acknowledge the Dalai Lama of Lassa as their supreme head. Priests (lamas and luvariaks) are said to constitute one-third of the male population. They dress in yellow, with scarlet scarfs, lead a life of celibacy, and are the only depositaries of learning. Superstitions are rife among the people, and soothsaying and sorcery are practised extensively. Only superior people are buried or burnt after death. The common people are exposed to be devoured by birds and beasts of prey. They trade almost exclusively with China Proper, to which they send live stock of all kinds, receiving in return large quantities of brick tea, tobacco, brandy, silk, cotton and woollen fabrics, boots, and metallic wares. A remarkable phenomenon among the Mongols has been the migration of whole nations from one district to another. One of these took place in 1771, when 300,000 persons of the Kerait tribe migrated to China to escape from the influence of Russia.

**MONGOLS' or MOGULS'**, a fierce and warlike tribe of Tartars of Central Asia, who first rose to great power under Genghis Khan (or Zingis Khan) at the beginning of the thirteenth century, and were possibly the greatest scourge that ever lashed the world. Elsewhere it is told how the chief Temugin became in 1206 GENGHIS KHAN, or "Greatest of Khans" (see the article under that heading), the "Cambuscan bold" whose story Chaucer has "left half told." Neither khan nor subjects could read or write, or had anything fairly to be called civilized habits. But Genghis Khan, though a savage, was an exceedingly able ruler, and perceiving the moral advantages of the Moslem faith, he forcibly put down the old idolatries of his tribe and promulgated as the one necessary article of faith belief in God. All religions were tolerated under this simple creed, and all religious teachers held free from military service. Before this remarkable barbarian died, his army of 700,000 men had reduced under his sway the whole tract of Asia, from the Volga to the Pacific, and from Siberia to the Persian Gulf. The Sultan of Charizme, who reigned over the land from the Persian Gulf to the confines of India, was ambitious enough to refuse annexation; and as a result the Mongols ravaged the whole extent of his dominions from one end to the other, overthrowing and blotting out in four years the ancient civilization that six centuries since have not sufficed to replace. A rebellion in Tartary recalled Genghis Khan to its subduing; and he died there in 1227, exhorting his sons to complete the conquest of China, which he had begun some years before. He is credited with the death of 500,000,000 of the human race. As the Mongols began, so they continued.

Ocetai Khan (or Oghotai), the son of Genghis, subdued Northern China in 1234, and then despatched 500,000 of his best warriors, under the famous Batu, his nephew (and brother of Kublai Khan), who was then governing the

Caspian provinces, to invade the West. This dreadful scourge, between 1235 and 1245, overran Turkestan, Astrakhan, Georgia, Circassia, Russia (when they laid Moscow in ashes), Poland, and Hungary. After wasting Servia, Bosnia, and Bulgaria, they retired, retaining of their conquests only as far west as Russia as a permanent possession. Another brother, Sheibain, conquered Siberia about 1242. At Ocetai's death, his son Kuyuk reigned, but after Kuyuk another of these famous brothers, Ocetai's nephews, came to the throne as Mangku Khan, and he was followed by the still more famous brother, Kublai Khan. These, and their great general (and brother) Hulagu, added Persia in 1258, and the middle and south of China, between 1260 and 1279, to the vast empire of Genghis. Marco Polo's visit brings us personally before Kublai. This greatest of the Mongols even desired to conquer Japan, and wasted 100,000 men on the enterprise. He did conquer Corea in the north, and Tonquin, Cochinchina, &c., in the south; and Bengal and Tibet alike owned his supremacy. His capital was the town we now call Peking. His religious tolerance was unlimited. He even sent to the Pope for Christian priests. The empire was, of course, far too great to last. Kublai and Mangku lived in a house, abandoning the tent-life of their grandfather. The primitive fierceness further decayed in their successors, and with it the nominal empire fell to pieces, but it revived to the full in the atrocious TIMUR-ILK (Tamerlane), one of the descendants of Genghis, as he asserted—a man of feeble body (though not under-sized), and maimed of one hand and one foot, but as bloodthirsty a creature as ever disgraced human form. One after the other Turkestan, Persia, and Hindustan fell before him, and in 1401 he reduced Syria, thus coming into collision with the formidable Ottoman power then wielded by Sultan Bayazid, the Thunderbolt. Damascus and Aleppo he laid in ashes, and on the ruins of Bagdad he built a pyramid of 90,000 skulls; then advancing through Armenia he encountered Bayazid at Angora, defeated him, and took him prisoner, July, 1402. He is said to have dragged the wretched "Thunderbolt" along with his army, imprisoned in an iron cage, but the tale is gravely doubted. Timur now meditated descending on Europe. Meanwhile the descendants of Genghis Khan were expelled from China, and Timur, hastening to avenge the insult, died on the road in 1405. After a short attempt on the part of his son to preserve the vast empire a peasant had thus created in his own life and alone, Timur's conquests dissolved; but his grandson, Baber, founded the more enduring MOGUL EMPIRE of Hindustan.

Under the head of *Mongolian*, or more accurately of TURANIAN peoples, a large number of races are massed together, and the total amount is estimated at 580,000,000, as many as the Caucasians of Europe and the Ethiopians of Africa put together. The Mongols proper now occupy the great space of the inhospitable plateau of Central Asia, with fragments widely scattered—one of them (the Kalmucks) occupying a large tract astride the Volga near its mouth. Eastward they reach along the northern frontier of China, touching the Manchu Tartars, the conquerors and administrators of China during the last two centuries.

*Language.*—The Mongol tongue is one of the Turanian tongues; but its affinity to Manchu, Finnish, Samoyed, &c., is not at all comparable to the affinity of Greek with Sanskrit, or any other affinity among the Indo-European group. In fact the chief bond of union is a common agglutinative composition, and a general harmony of structure rather than a common stock of roots, as with our own group of tongues, though these latter are not altogether wanting. One great peculiarity of Mongolian and some of the allied tongues is the curious vowel harmony. All the vowels are grouped, *a, o, u* being the "hard," *i* the "medium," *e, ö, ü* the "soft;" and all the vowels in any word must be of the same group. The Mongol alphabet

is derived through the Uigur Turkish from the Syriac. It gives seven vowels, eight diphthongs, and seventeen consonants. Sanskrit and other words necessitate further sounds which are expressed by a subsidiary alphabet, the Galik. Many letters are ambiguous, and the same sign is often differently pronounced according to its position in the word. Thus *ordu* (palace) and *urtu* (long), *naran* (sun) and *nere* (name), with countless other words, are written precisely alike. The writing is in perpendicular lines beginning from above, the first column being to the left. To get rid of much trouble with this clumsy alphabet, the Saga Pandita invented the Kalmuck alphabet in 1648, founded on the Mongol, but with many improvements as to facility in use, and avoiding nearly all ambiguities. The Kalmuck is therefore now used as a key to the older and difficult Mongol. The spoken languages differ very slightly, but the writing sometimes differs considerably between the two, because, while the Kalmuck spelling is strictly phonetic and follows the present pronunciation, the Mongol spelling is retained without alteration from the ancient original style.

**MONIM'ACEÆ** is an order of plants belonging to the **MONOCHLAMYDEÆ**. The species are aromatic trees or shrubs, natives of South America chiefly, but also occurring in North America, Asia, Australia, and the islands of the South Pacific. The genus *Monimia* is native in Mauritius. The *Sassafras* tree of New South Wales (*Dorogyphora Sassafras*) belongs to this order. Its bark is used by the colonists as a tonic, and the soft light wood is used for packing-cases, &c.

The following are the chief characters of the order:—The flowers are regular, hermaphrodite or unisexual. The perianth is calyx-like, the tube clothed on the inside with a disc which bears the stamens; there are four or many teeth or lobes. There are several stamens. The carpels of the ovary are numerous, included in the perianth, sessile at its bottom, or immersed in the disc, one-celled, with a short style and simple terminal stigma. The ovules are solitary in each carpel, erect or pendulous. The leaves are generally opposite.

**MON'ISM**, the philosophical doctrine of the unity of substance, found its great interpreter in the renowned Spinoza, "the god-intoxicated philosopher" (1632-77). Angry with the Cartesian dualism which separated God and the world, mind and matter, and which was driven at last to assert, as an explanation of the correspondence between thought and action which we nevertheless daily and hourly perceive to exist, that as bodily changes are about to occur God places the corresponding thought in our minds at that instant, and that as we think or will God causes the corresponding action to take place, Spinoza undertook to replace the dualism of soul and body by proving, with the rigour of geometrical method, that "there is only one substance, and that is God." This is, on its philosophical side, pure monism, and on its theological side pure pantheism. Leibnitz sought to reconcile dualism and monism by his theory of **MONADS**.

Another variety of monism is that of the French Benedictine monk Deschamps (1716-74), who regarded the universe (*le tout universel*) as a real being (*un être qui existe*), and that substratum (*fond*) of which all perceivable things are modifications (*nuances*). This view is called *hylozoism*.

Finally, for nothing is new under the sun, Von Hartmann's recent "Philosophy of the Unconscious" is but a veiled monism, the subject being the unconscious spirit with the attributes of will and idea. He affirms that it is equally as impossible for the "logical idea" of Hegel to attain reality without will as for the "irrational will" of Schopenhauer to determine itself to prototypal ideas, and therefore he demands the co-ordination of the two, and their treatment as merely contrasted functions of one and the same functioning essence.

**MONITEUR, LE**, long the official newspaper of the French government. It was commenced in 1789, and then called the *Gazette Nationale, ou Le Moniteur Univer-el*. During the Revolution it acquired a large circulation, and great influence as a daily register of the terrible events that were then enacted. In 1800 it became an official paper. It was superseded by the *Journal Officiel*, 1st January, 1869, but it is still published as an ordinary journal.

**MON'TOR** is the name applied to the lizards of the family Monitoridæ in consequence of the supposed warning they give of the approach or proximity of the crocodile. The monitors are the largest known lizards. The body is very long, more or less rounded, and the tail is generally compressed, and at least as long as the body. The limbs are strong; the toes are five in number, very long, but of unequal size, and terminate in strong hooked claws. The head is covered with polygonal plates, and the skin of the body is beset with numerous scales placed side by side, each encircled by a ring of very small tubercles. The tongue is long, slender, and forked, and is capable of being withdrawn into a sheath. There are teeth in both jaws, but none on the palate. The eyes are large and bright. The monitors are found chiefly in the warmer parts of the Old World, but one genus (*Heloderma*) is American. They live near the water's edge, and the greater number are aquatic in their habits. A few, however, are completely terrestrial, living in dry, sandy deserts. They are carnivorous, living upon small quadrupeds, birds, and the larger kinds of insects. They often devour the eggs of crocodiles and aquatic birds; and even small fishes, lizards, and tortoises fall victims to their voracity.

The Monitor of the Nile (*Monitor niloticus*) is about 5 or 6 feet long, and of a greenish-gray colour, mottled with black. The nape of the neck presents four or five horse-shoe marks of a yellow hue; and along the back seven or eight rows of spots of a yellowish-green tint extend from the shoulders to the root of the tail. The tail is compressed throughout nearly its whole length, and strongly crested or keeled on the upper edge. It is one half longer than the body. This monitor is very common in the Nile, and is held in great veneration by the natives of Egypt, who assert that by the hissing noise which it produces, it gives warning of the approach of the crocodile. It also occurs in most of the other rivers of Africa. Its figure occurs on the ancient Egyptian monuments, probably on account of its devouring the eggs of the crocodile. The Sand Monitor (*Psemmosaurus arenarius*) inhabits the dry arid deserts of Egypt. It is less voracious than the Nilotic species, and its food consists mainly of insects and eggs. It is about 3 feet long, and the tail is round and devoid of any keel. The Lace Lizards (*Hydrosaurus*) are large forms, natives of Australia. The genus *HELODERMA*, which is usually placed in this family, contains two species, natives of America, which are the only venomous lizards known to science.

**MONK, GENERAL**. George, the eldest son of Sir Thomas Monk of Petheridge, Devonshire, was born 6th December, 1608. At the age of seventeen he acted as a volunteer, under Sir R. Grenville, in the expedition to Cadix, and in 1627 served with distinction in the expedition to the Isle of Rhé. In 1629 he went to the Low Countries, and served in the Dutch army under Lords Oxford and Goring, returning to England in 1638, at the commencement of the conflict between Charles I. and the Scots. As lieutenant-colonel in Lord Newport's regiment he displayed considerable skill and daring, and in consequence he was afterwards intrusted with a command in Ireland. Here he greatly increased his reputation, but his fidelity was suspected by the king, and he was for a time placed under arrest. He succeeded in satisfying the king of his innocence, however, and was appointed major-general of the Irish brigade, but in 1644 he was taken a prisoner by Fair-

fax and was committed to the Tower. In 1647 he abandoned the royal cause, took the Covenant, and was sent by Cromwell to Ireland. Here he had to contend against numerous difficulties, and in the end had to conclude a treaty with the Irish leader O'Neil, and to surrender Dundalk to the Royalist general, Lord Inchiquin. In 1650 Cromwell gave him the command of a regiment and placed the artillery under his charge, and Monk rendered good service by his bravery and skill at the battle of Dunbar. Left in Scotland at the head of 6000 men, he rapidly completed the subjugation of the country, most of the towns, intimidated at his vigour and severity, surrendering at discretion. In the war with Holland in 1653 he was placed with Blake and Dean in command of the British fleet, and with Dean, on the 2nd, 8rd, and 29th July, he fought two of the most sanguinary naval battles recorded in the history of Europe, in which both his colleague and the Dutch admiral Van Tromp were slain. On the termination of the war Monk was sent by the Protector to suppress an insurrection which had broken out in Scotland, and having accomplished this he remained there as governor for five years. After the death of Cromwell, Monk, who was the most popular commander with the army, was the most powerful man in the kingdom, and he managed matters with such consummate address that he was enabled, in 1660, to effect the restoration of Charles II. He was speedily loaded with honours and rewards; was created Duke of Albemarle, knight of the Garter, sworn a member of the Privy Council, made master of the horse, gentleman of the bedchamber, and first commissioner of the Treasury, and received the grant of an estate worth £7000 a year, representing over £20,000 at the present day. In return he assisted in the trial of the regicides, acquiesced in the insults put upon the corpse of his old commander, the illustrious Blake, and even gave up some private letters in order to secure the condemnation of Argyle. In 1664, when the war broke out with Holland, he was placed at the head of the admiralty; and when, in 1665, the plague broke out in London, he remained in charge of the capital, displaying as usual great courage and prudence. In 1666 he encountered the Dutch in a naval battle that lasted four days—23rd to 26th June—and terminated without any decisive result; and again on 23rd July, when to his customary courage and coolness he added the most reckless daring. He died 3rd December, 1669, leaving an immense fortune to his only son, by Ann Clarges, a milliner, who had been for some years his mistress before she became his wife. His wife was a woman of masculine character and furious temper, and even exceeded him in avarice. A fortunate military adventurer, Monk was courageous, cautious, taciturn, and strong-willed, though somewhat sluggish. With a higher moral character he might have been a great man, but unscrupulous and selfish, he always remained a mean one. As Clarendon observes, "Profit was always the highest reason with him." On the death of his son in 1688 the title became extinct.

**MONKEY** is a general name applied to the whole of the order PRIMATES, excluding man and the anthropoid apes. Two very distinct groups are established—the Catarrhine Monkeys, or those of the Old World; and the Platyrrhine Monkeys, or those of the New World. These names are given to them on account of the well-marked differences in the form of the nose. The catarrhine group are noted for their narrow nose, in which the nostrils are placed close together. The platyrrhine group, on the contrary, are distinguished by a broad and flat nose, with nostrils wide apart and separated by a broad *septum* or partition. The true monkeys of the Old World differ from the apes in the constant presence of callosities or hard bare patches on the buttocks, and by the almost constant presence of cheek-pouches and a long non-prehensile tail. The BABOONS, which belong to this group, are distinguished chiefly by the shortness of the tail, the long muzzle, and dog-shaped

head. The platyrrhine or American monkeys are destitute of callosities and cheek-pouches, and in most cases have a long prehensile tail, which is of such service to them in their rapid movements among the branches of trees that it has been called a fifth hand. For the divisions of the order PRIMATES see that article.

**MONKEY POTS.** See LECYTHIS.

**MONKEY PUZZLE.** See ARAUCARIA.

**MONKS.** See MONASTICISM.

**MONKSHOOD.** See ACONITE.

**MONMOUTH**, an English county bordering on South Wales, is bounded N. by Herefordshire, E. by Gloucestershire and the river Wye, S. by the Bristol Channel and the estuary of the Severn, and W. by a detached portion of Herefordshire, by Brecknockshire, and Glamorganshire. Its greatest length E. to W. is about 28 miles; its greatest breadth N. to S. 35 miles. The area is about 572 square miles, and the population in 1881 was 211,267.

Monmouth is a country of hill and dale, wood and meadow, with hills of considerable height on the west side, towards the Black Mountains. Sugar Loaf Hill is 1852 feet high; Blorenge, 1720 feet; Mynydd Maen, 1563 feet; Skyrdd Vawr, 1498 feet. The scenery in many parts is exceedingly beautiful. The climate is mild in the valleys. The prevalent rock is Old Red Sandstone, as far as Pontypool, where the Great South Wales basin of coal and iron ore begins, which is a district threaded by several long, parallel valleys sloping towards Newport, the chief outlet for the mineral treasures of the county. Forges, tin works, rolling mills, mines, canals, and railways have completely altered the face of these solitudes, and multiplied the population beyond example. The principal works are carried on at Pontypool, Aberyshchan, Pantwyn, Blaenavon, Nantyglo, Beaufort, Sirhowy, and Ebbw Vale, Tredgar, Rhymney, &c. Knitted caps and stockings are also made, but there are no important manufactures.

The Wye forms the eastern boundary of the county and flows south-east and south past the town of Monmouth to Chepstow, below which it enters the estuary of the Severn. Its whole course is marked by a succession of beautiful and romantic landscapes. The Usk enters Monmouth from Brecknockshire near the town of Abergavenny, and flows south-east, south, and south-west through the centre of the county till it enters the Bristol Channel by an estuary below the town of Newport. The Runney forms the western boundary of the county, and falls into the Bristol Channel. The Monnow forms the boundary of the county on the north-east, and falls into the Wye below Monmouth. The Ebbw flows through the county from N.N.W. to S.S.E., and falls into the estuary of the Usk below Newport.

The soil of Monmouth is various but generally fertile. The agriculture has been much improved of late years. The southern tract bordering on the Bristol Channel is an alluvial soil, which in parts would be overflowed if not protected by great dykes.

Monmouth is divided into six hundreds. It is in the diocese of Llandaff, and in the Oxford Circuit. The assizes are held at Monmouth. Under the Redistribution of Seats Act of 1885 the county returns three members to the House of Commons.

**History and Antiquities.**—Monmouth at the time of the Roman invasion was occupied by the Silures, who remained unmolested by the Romans until the reign of Vespasian, when they were conquered by Julius Frontinus. From this time the Romans occupied their country until the year 408. It was then included in their province of Britannia Prima. Caerleon and Caerwent, under the names of *Iaca Silurum* and *Venta Silurum*, were important Roman stations on the *Via Julia*, or Julian Way. It is a subject of dispute whether Monmouthshire was ever wholly conquered by the English; but they occupied the town of

Monmouth, Chepstow, and Caerleon. The Norman kings, after their conquest of England, allowed the barons to make incursions at their own expense, and rewarded them with the gift of the lands which they subdued. Monmouth, however, was not included in England until the reign of Henry VIII.

The principal ecclesiastical antiquities of this county are Tintern Abbey and Llanthony Abbey. The ruins of Tintern Abbey are situated on the right bank of the Wye, about 9 miles below Monmouth. The roof and tower of the building have fallen, but the greater part of the rest remains in tolerable preservation. The abbey was founded in 1131 for Cistercian monks, by Walter de Clare, and dedicated to St. Mary. It owes much of its present fame to the fine poem in which it has been celebrated by Wordsworth. The surrounding country is eminently picturesque. Llanthony Abbey stands at the foot of the Black Mountain, in the Vale of Ewas and hundred of Abergavenny. The building is of earlier date than that of Tintern, and in a style of transition from Norman to Early English architecture. Only a small portion remains. Ruins exist of about twenty-five castles, including those of Raglan, Chepstow, Caldecot, Abergavenny, Grosmont, Dinham, Monmouth, where Henry V. was born, and Usk, the birth-place of Richard III. and Edward IV.

MONMOUTH, the chief town of the above county, and a municipal borough, is situated amidst very fine scenery in the north-east of the county, on the Wye, 184 miles from London by the Great Western Railway. The population in 1881 was 6111. Monmouth is the centre of a district of boroughs with a total population of 46,033, returning one member to the House of Commons. The spring and summer assizes and courts of petty sessions are held here. It is the place of election, and a polling-place for the county, the seat of a county court, and the head of an archdeaconry. There are some iron and tin-plate works, corn mills, tanneries, and paper mills, and a good carrying trade is carried on by means of the Wye. The town stands among hills in a beautiful part of the Wye, near the mouth of the Monnow, which winds round it, and from which it borrows its name. It consists chiefly of one main street; it is neatly built and paved, and has a good supply of water. There are remains of the Norman castle in which Henry V. was born in 1387, of a priory house, and of the old town walls near the Welsh-gate, on the Monnow bridge. The principal buildings are—St. Mary's Church, in the Early English style, with a spire 200 feet high, once the Priory Church; St. Thomas' Norman Church, and four chapels; town-hall, on pillars, and statue of Henry V.; savings bank; library; gas-works; Nelson's Pavilion, on the Kymin Hill; Jones' free grammar school, for which new buildings were erected in 1865; almshouses, and union poorhouse. Three bridges respectively cross the Wye, the Monnow, and the Trothey, a branch of the Wye. In the vicinity of Monmouth is Troy House, in which are preserved the cradle of Henry V., and the armour he wore at Agincourt. This monarch, and Geoffrey of Monmouth, the famous historian, were born in this town. The old British name of Monmouth was *Mongwy*. Its first charter was granted by Edward VI. Under the Municipal Act its corporation consists of four aldermen and twelve councillors. Woollen caps were once largely manufactured in the town. They are referred to by Shakspeare ("Henry V., act v. scene 7); and it was ordered by the Act 13 Elizabeth, cap. 19, that they should be universally worn on Sundays and holy days.

**MONMOUTH, GEOFFREY OF**, a historical romancer rather than a chronicler proper, wrote immediately after William of Malmesbury, the great chronicler-writer. Robert earl of Gloucester was the good patron of both these distinguished men, and Geoffrey's "History of British Kings," which appeared in 1147, is dedicated to him. Geoffrey was a Welsh priest of considerable culture, both

in Latin and Welsh, and used a fine old Welsh history of Britain, full of marvels, much as the "Ossianic poems" were used by Macpherson in the first years of George III. The first copy was in four books, which, however, he expanded into twelve, building an entire fanciful romance upon a slender basis of fact, and casting the whole as closely in the mood of the actual chronicles as Defoe could have done had he lived in that time. His kings are exactly described in minute detail, all the way from Brut, great grandson of Æneas of Troy, to Cadwallo, who died in 689. Many devoutly believed in the whole, but the graver chroniclers were greatly scandalized, and failed not to use very strong language on this "fabler, whose fables shall be straightway spat out by us all." Gorboduc (theme of our first tragedy), Lear, and King Arthur himself we owe to the imagination of Geoffrey.

**MONMOUTH, JAMES, DUKE OF**, was the son of Lucy Walters, a mistress of Charles II. during his exile, and was born 9th April, 1649. His paternity is doubtful, but Charles always regarded him as his own son and treated him with great tenderness. In 1665, at the age of sixteen, he was married to Anne Scott, the daughter of the Earl of Buccleuch, the wealthiest heiress of Scotland, having previously been created Duke of Orkney, Duke of Monmouth, and knight of the Garter. At the court he was treated as a prince of the blood, and honourable and lucrative offices were showered upon him by the king. In 1665 he displayed much courage under the Duke of York in the naval battle of Lowestoft, and in 1673 he gained some distinction in command of the English auxiliaries against the Dutch, but his fame was tarnished by his shameless vice and profligacy. At this time, when the country was greatly alarmed at the prospect of a return to Roman Catholicism, Monmouth became the tool of a faction which sought to make him the rival of the king's brother, James, duke of York. A story to the effect that Charles had been married to Lucy Walters was set afloat. The king, however, gave this a public and formal denial, and in 1679 Monmouth was ordered to retire to Utrecht. He returned, however, the same year, and under the guidance of Shaftesbury he made a kind of royal progress through the discontented counties of England, accompanied by a retinue of malecontent nobles who were conspiring to excite a general insurrection throughout the country. The immediate fruit of this extensive conspiracy was the Rye House Plot. Monmouth saved himself from prosecution by betraying all he knew, and by expressing penitence both to the king and the Duke of York. He afterwards withdrew his confession and was compelled to leave the country. On the accession of James II. Monmouth weakly yielded to the counsels of Lord Grey, Fletcher of Saltoun, Robert Ferguson, and the Earl of Argyle, to attempt the invasion of England. On 11th June, 1685, he landed with a small following at Lyme Regis, and published a declaration branding James as a murderer and usurper, and declaring himself the legitimate heir to the throne. From the first the expedition was a miserable failure, and after the disastrous defeat of Sedgemoor, 6th July, Monmouth fled for his life, but was arrested two days afterwards and sent to London. He made the most abject submission to James, and at a personal interview and by letters pleaded desperately for his life, but James was unrelenting, and on 15th July, 1685, Monmouth was executed on Tower Hill. (See Macaulay's "History of England," vols. i., ii., and Green's "Short History of the English People.")

**MONOCEROS** (the Unicorn), a rather obscure constellation of Hevelius, surrounded by Hydra, Canis Major, Orion, and Canis Minor. See **PLATES CONSTELLATIONS**, both Northern and Southern Hemisphere, on the margin at the figures VII., VIII.

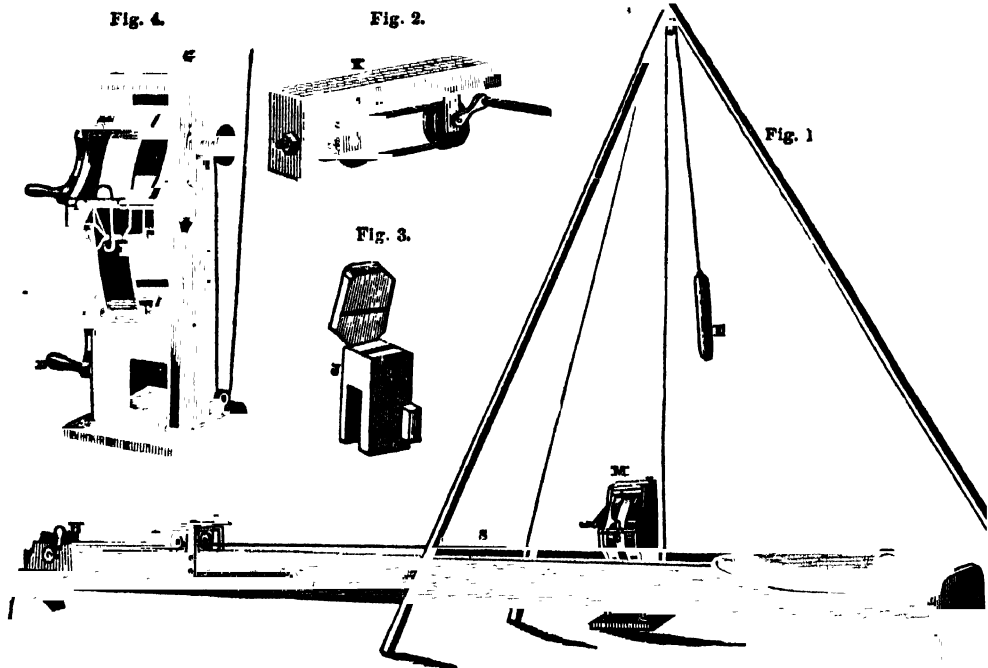
**MONOCHLAMYDEÆ** is a division of the plants grouped together as Angiospermæ, in which there is a

calyx and no corolla, or a calyx-like perianth of more than one whorl, or in which the perianth is reduced to scales or is altogether absent. The flowers are often unisexual, and grouped in cones or catkins. Other names for this division are *Apetalæ* and *Incompleteæ*, but it is an unsatisfactory and artificial grouping, as many of the orders really belong to the *Polypetalæ*. The classification of the orders in this division, according to Bentham and Hooker, is given in the article *BOTANY*.

**MON'CHORD** (Gr. *monochordos*, with one string), an instrument of one string, used by scientific musicians for the purpose of ascertaining and demonstrating the relative proportions of musical sounds. It is composed of a board or rule, divided and subdivided into various parts, and of a string stretched across two bridges, one of which is movable.

It is not difficult so to arrange a monochord as to ascertain the number of vibrations in a second of a string tuned to a certain pitch by ear, and to register and print them. Such an apparatus is shown in fig. 1, where *m* is the

registering apparatus; *x*, the frame of the monochord; *s*, its string; *u*, the counter-weight and triangular support; *k*, a rotating bow, by which the string of the monochord is kept in a state of constant vibration for any required time (seen in detail in fig. 2). *j*, fig. 3, is the movable bridge used in tuning the string of the monochord. Fig. 4 is the registering apparatus. The upper cylinder, *A*, holds the paper on which the vibrations and seconds are to be printed. The middle cylinder, *B*, is covered with carbonized tracing paper. One end of the paper on the upper cylinder, *A*, is attached to the lower cylinder, *C*, and when the apparatus is in action it is wound on to the lower cylinder by turning the handle, *D*. This paper is strained and kept in close contact with the tracing paper on cylinder *B* by the resistance of the counter-weight *E*, shown in fig. 1. The string to which the counter-weight is attached proceeds from the reel forming part of cylinder *A*, passing under a pulley on the foot-board of the registering apparatus, and from thence over a pulley attached to the upper part of the triangular support of the counter-weight. The



string of the monochord, when put into a state of vibration, impinges on the piece of brass attached to the spring and printing point *F* (fig. 4), which is caused to strike the paper in contact with the tracing paper on cylinder *B*. The paper consequently receives a printed dot, and if the paper were at rest the printing point would continue to strike at the place where the dot was printed; but as the paper during the operation is in constant motion by being wound from cylinder *A* to cylinder *C*, it receives a succession of printed dots from the tracing paper, thus recording the vibrations of the string of the monochord. At the same time the plate at the end of the rod *G* (fig. 4) is struck by the finger every second, either by watching a pendulum, or what is more convenient, a metronome set to sixty, which will give seconds; by this process a second series of printed dots is obtained, which mark off the number of vibrations that have passed in every second. The string of the monochord is tuned by means of the screw *H* (fig. 1).

**MON'CLINE** is the term applied in geology to the curve joining two horizontal portions of strata on different horizons. It appears as though formed by the bodily upheaval of a portion of a horizontal set of beds, the curved strata joining the upheaved portion and the beds remaining at the lower level, forming the monocline: where the flexure is too sharp or the displacement great a fault is produced. A remarkable example of a monoclinical fold occurs in the South of England, where the cretaceous and tertiary rocks are bent into a sharp fold in the Isle of Wight.

**MONOCLIN'IC FELSPAR** is the name often applied to orthoclase to distinguish it from the triclinic or plagioclastic feldspars. Orthoclase and hyalophane or baryta feldspar are the only two feldspars crystallizing in the monoclinic system.

**MONOCLIN'IC SYSTEM** of crystallization is that in which there are three axes unequal, and one of them, the *clino-diagonal*, inclined to the plane of the other two: the longer axis of these is termed the principal axis, that at

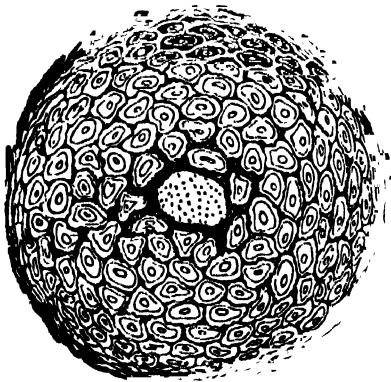
right angles to it the *ortho-diagonal*. The cleavage in this system is usually parallel to the plane of two of the axes, or parallel to one of the prisms or domes: when occurring in more than one direction in any species it differs in degree in the different directions. Common minerals crystallizing in this system are orthoclase, augite, hornblende, and gypsum, besides many others.

**MONOCOTYLEDONS** is one of the large primary classes into which the vegetable kingdom is divided. The class derives its name from the seed having only one cotyledon. It was also known as Endogens, which name it received in consequence of its new woody matter being constantly developed, in the first instance, towards the interior of the trunk, only curving outwards in its subsequent course downwards. That palm-trees grow in this way was known so long ago as the time of Theophrastus, who distinctly speaks of the differences between endogenous and exogenous wood.

But that this peculiarity is also extended to a considerable part of the vegetable kingdom is a modern fact, the discovery of which we owe to the French naturalists Daubenton and Desfontaines. The path was subsequently much extended, especially by Mohl, in an elaborate essay upon the anatomy of palms.

For convenience we may take the phenomena of growth in a palm-tree as typical of the monocotyledonous structure. In the beginning the embryo of a palm consists of a cellular basis, in which a certain number of bundles of ligneous fibre are arranged circularly (fig. 1) down the radicle, deriving their origin from the plumule. Immediately subsequent to germination, and as soon as the rudimentary leaves of the plumule begin to lengthen, spiral vessels appear in their tissue in connection with the ligneous bundles; the latter increase in quantity as the plant advances in growth, shooting downwards through the cellular tissue, and keeping parallel with the outside of the root. At the same time the cellular tissue increases in diameter to make room for the descending woody bundles. At last a young leaf is developed with a considerable number of such bundles proceeding from its base downwards, and as its base passes all round the plumule, consequently passing downwards alike on all sides of the centre that it surrounds.

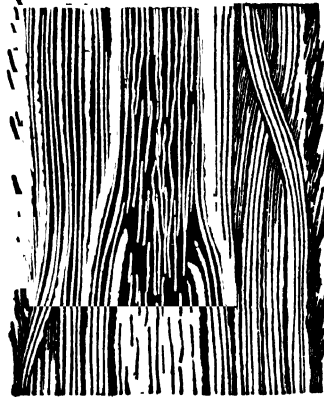
Fig. 1.



Within this a second leaf gradually unfolds, the cellular tissue increasing horizontally at the same time. The woody bundles, however, soon cease to maintain anything like a parallel direction, but curve outwards as they pass downwards, losing their extremities in the roots, or in the cellular integument on the outside of the first circle of bundles (fig. 1). At the same time the second leaf pushes the first leaf a little from the centre towards the circumference of the plane or cone of growth; the consequence

of which is that the woody bundles next the base of the first leaf are drawn a little outwards, and form descending axes, which henceforwards are found at first to curve inwards towards the centre of the young stem, and afterwards outwards towards its circumference. In this manner leaf after leaf is developed, the horizontal cellular system enlarging all the time, and every successive leaf, as it forms at the growing point, emitting more woody bundles curving downwards and outwards, and consequently intersecting the older arcs at some place or other. The result of this

Fig. 2.



is that the first-formed leaf will have the upper end of the arcs which belong to it longest and much stretched outwards, while the youngest will have the arcs the straightest; and the appearance produced in the stem will be that of a confused entanglement of woody bundles in the midst of a quantity of cellular tissue (fig. 2). As the stem extends its cellular tissue longitudinally while this is going on, the woody arcs are consequently in proportion long, and in fact usually appear to the eye as if almost parallel, except here and there, where two arcs abruptly intersect each other. As in all cases the greater number of arcs curve outwards as they descend, and eventually break up their ends into a multitude of fine divisions next the circumference, where they form a cortical integument, it will follow that the greater part of the woody matter of the stem will be collected near the circumference, while the centre is kept comparatively open, and will consist chiefly of cellular tissue; and when, as in many palms, the stem has a limited circumference, beyond which it is its specific nature not to distend, the density of the circumference must, it is obvious, be proportionably augmented.

In many of the larger kinds of endogens the stem increases principally by the development of a single terminal bud, a circumstance unknown in exogens properly so called. In many, however, as all grasses, the ordinary growth takes place by the full development of the axillary buds in abundance. In general there is so great a uniformity in the structure of a monocotyledonous stem that the common cane or asparagus sufficiently illustrates its peculiarities.

*Grasses* are endogens with hollow stems strengthened by transverse plates at the nodes. This is seen in the bamboo, whose joints are used as cases to hold rolls, or in any of our indigenous species. In this case the deviation from habitual structure is owing to the circumference growing faster than the centre, the consequence of which is the tearing the latter into a fissural passage, except at the nodes, where the arcs of ligneous tissue originating in the leaves cross over from one side of the stem to the other, and by their entanglement and extensibility prevent the possibility of any rupture taking place. That this is so is proved by the fact that the stems of all grasses are solid

or nearly so, as long as they grow slowly; and that it is when the rapidity of their development is much accelerated that they assume their habitual fissural character. Independently of that circumstance their organization is quite normal.

The age of endogenous trees has been little studied. When the circumference of their stem is limited specifically, it is obvious that their lives will be limited also; and hence we find the longevity of palms inconsiderable when compared with that of exogenous trees. Two or three hundred years are estimated to form the extreme extent of life in a date palm and in many others. But where, as in *Dracæna*, the degree to which the stem will grow in diameter is indefinite, the age seems, as in exogens, to be indefinite also.

Important as the character furnished by the internal manner of growth of a monocotyledon obviously is, it is much enhanced in value by its being found very generally accompanied by peculiarities of organization in other parts. The leaves have, in almost all cases, the veins placed in parallel lines, merely connected by transverse single or nearly single bars. When such an appearance is found in dicotyledons it is always fallacious, and is found to be owing to the excessive size and peculiar direction of a few of the larger veins, and not to be a general character of the venation, as is sufficiently obvious in *Plantago lanceolata*, *Gentiana lutea*, and many more. The flowers, too, of monocotyledons have in most cases their sepals, petals, and stamens corresponding with the number there, or clearly referable to that type; and the pistil usually participates in the same peculiarity. Where such a proportion exists in dicotyledons it is usually confined to the sepals and petals by themselves, or to the pistil by itself, not extending to the other organs. In monocotyledons it is almost universal in all whorls of the flower, although sometimes obscured by the abortion, dislocation, or cohesion of particular parts, as happens in the whole of the extensive natural order of grasses.

The embryo of a monocotyledon is, in its commonest state, a small undivided cylinder, which protrudes from within its substance a radicle from one end and a plumule from a little above the radicle; in other cases its embryo has a slit on one side, in the cavity of which the plumule reposes; or, finally, the embryo is a flat plate, as in grasses, with the plumule and radicle attached to its face near the base. In the latter case the flat plate is a solitary cotyledon, which, in the second instance, is folded together so as to give the embryo the appearance of being slit, and which in the first, or most habitual condition, is not only folded up, but united at its edges into a case entirely burying the plumule and cotyledon. Hence the embryo is called monocotyledonous—a name that is really unexceptionable, notwithstanding the occasional appearance of a second rudimentary cotyledon, as occurs in common wheat.

It has already been stated that the radicle is protruded in germination from within the substance of the embryo; the base of the radicle is consequently surrounded by a minute collar formed of the edges of the aperture produced by the radicle upon its egress. For this reason monocotyledons are called *endorhizal*.

Hence the great natural class of plants forming the subject of these remarks has five most important physiological peculiarities, by all which combined, or usually by each of which separately, the class may be characterized:—(1) The wood is endogenous; (2) the leaves are straight-veined; (3) the organs of fructification are ternary; (4) the embryo is monocotyledonous; and (5) the germination is endorhizal.

Monocotyledons probably contain more plants contributing to the food of man, and fewer poisonous species, in proportion to their whole number, than dicotyledons. Grasses, with their floury albumen, form a large portion of this class, to which have to be added palms yielding fruit, wine, sugar, *sago*, *Aroidaceæ*, *Maranta*, some *Amaryllidaceæ*, &c., pro-

ducing arrow-root, the nutritious fruit of the plantains, the aromatic secretions of *Zingiberaceæ*, *Orchidaceæ*, forming *saleb*, and *Dioscoreaceæ*, producing *yams*. Among the deleterious species we have little worth notice beyond the poisonous mucilage in the bulbs of certain *Amaryllidaceæ* and the acrid secretions of *Aroidaceæ*. For the classification of monocotyledons see the article **BOTANY**.

**MONOCIOUS** is a term used in botany when the flowers are unisexual, and the male and female occur on the same plant.

**MONOGRAM** (Gr. *monos*, one, and *gramma*, a letter), a cipher or character formed by an interlacing of letters, and intended as an abbreviation of a name. Monograms were formerly very fashionable, and are not uncommon on Greek and Roman coins. The Greek monogram on the name of Christ is found on coins of the reign of Constantine. The vertical stroke is the  $\Gamma$  of  $\text{ΙΗΣΟΥΣ}$  (Jesus), and the cross and half hoop at the top of the  $\Gamma$  give  $\text{ΧΡ}$ , the first letters of  $\text{ΧΡΙΣΤΟΣ}$  (Christ). The Latin one, *I.H.S.* (Jesus Homini Salvator), was invented by San Bernardino of Siena in 1437, and at once became a great favourite, replacing the more recedite Greek figure. On our Saxon coins, as, for example, those of King Alfred, monograms frequently occur.

**MONOLITH** (Gr. *monos* and *lithos*), a term introduced into English to signify a pillar hewn out of a single block of stone. Some remarkable examples have been found in Egypt, as the zodiac of Denderah and the obelisk of Luxor, which have been removed to Paris, and the stone called Cleopatra's Needle, more recently conveyed to London and erected upon the Thames Embankment. Herodotus describes a monolith at Sais, which contained an apartment 18 cubits long, 12 broad, and 5 high.

**MONOLOGUE** (Gr. *monos* and *logos*, a discourse), in its original sense, a speech uttered by one of the characters of a play when alone, and synonymous with the word soliloquy; but now frequently employed to designate a class of public entertainments in which a single person, by changes of dress and voice, represents several individuals.

**MONOMANIA**. See **INSANITY**.

**MONOMETRIC SYSTEM** of crystallization is the first degree of symmetry; in it there are three equal axes intersecting at right angles. This system is also called the **CUBIC**, **Isometric**, or **Regular System**.

**MONOPETALÆ**. See **GAMOPETALÆ**.

**MONOPHYSITE** or **JACOBITE HERESY**, founded by Jacob, bishop of Edessa (died 588), in continuation of the teachings of the heresiarch Eutyches, whose followers had also occasionally borne the name. The main point was the teaching of the absorption of the human by the divine nature of Christ, so that in him was only one nature (Gr. *monos*, one; *physis*, nature). There are many Jacobites still in Armenia and Egypt.

**MONOPOLIES** arose from the ancient prerogative of the crown in England to regulate all matters of trade. Even as early as the Conqueror's time we find merchants paying the king for exclusive privileges of one sort and another, and perhaps in these early times monopolies served a good purpose in encouraging commercial adventure. Every monarch, down to the close of the sixteenth century, not only sanctioned monopolies but encouraged them; but it was under the last ruler of this long period, the great Queen Elizabeth, that they rose to their greatest height. She in her devoted encouragement of English commerce fostered in every possible way the formation of the great London merchant companies, and granted them almost any privileges they desired. She carried out the same system with individuals in whom she saw, or thought she saw, ability to push any particular trade or manufacture. Thus, and also here and there, no doubt, from merely personal motives, she granted monopoly after monopoly,



until almost every main article of trade was limited to a few hands in the first instance. Salt, vinegar, leather, and coal were among the worst-farmed of these protected articles. The evil grew crying as the prosperity of England revived under the firm and patriotic rule of the queen. In 1571 questions in Parliament began to be plied. The queen caused the questioners to be reprimanded in the Star Chamber as having touched on matters "neither pertaining to the Commons nor within the compass of their understanding." In 1597 Sir Edward Hoby was courageous enough to attack the monopolists again. Parliament was stronger, the queen was aging, and the old treatment could not be maintained. Elizabeth knew when and how to yield, and at once promised to amend the matters complained of. Nothing was done, however, and therefore Lawrence Hyde introduced a formal Bill for the Abolition of Monopolies into the House of Commons in 1601, and it went up to the Lords with a strong majority behind it after four days of vehement debate, during which the queen's ministers had vainly done their utmost to hinder it. Elizabeth's tact again served her. She did not wait for the bill formally to come before her. She sent for the Commons, declared, with her usual unscrupulousness at critical moments, that she had no conception of the mischief these restrictions on trade were working, thanked "her faithful Commons" for calling her attention to them, and with a stroke of the pen annulled every single monopoly she had created.

Among the many unwisdoms of the foolish, fated Stuart kings was the revival of an evil so detested. James openly created and sold monopolies; and indeed in 1621 Sir Giles Monpesson was impeached before the Lords for having used base metal instead of the precious metals in working his monopoly of gold and silver thread. In 1624 the feeling had grown so overwhelmingly strong that James in his turn had to abolish monopolies; but patents for fourteen years, craftily substituted in their stead, almost annulled the benefit gained. Charles I. was not even content with his father's subterfuge, but openly and freely revived monopolies. When his great parliamentary struggles began he in his turn withdrew them (1639). Since then, as a custom of any magnitude, monopolies may be said to have disappeared. The old Corn Laws are often said to have indirectly created a monopoly among a whole class (the farmers) by freeing them from the wholesome competition of foreign grain. This is hardly a fair use of the term, but the effects are precisely of the same character. A monopolist can extort what prices he pleases for what inferior quality he chooses to supply, within very wide limits indeed, supposing he has that to sell which people really need. All such privileges are therefore productive of great evils. The only exception is that in favour of authors' copyrights and inventors' patents, which encourage research by securing a due reward for a limited time.

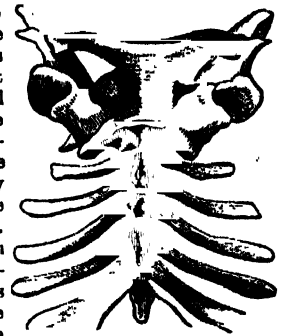
**MONORHINA** is a low group of Vertebrata, containing the hags and lampreys. This group (also called Cyclostomata and Marsipobranchii) is usually classed with the fishes; but though, for ordinary purposes, it is useful to allow the name fishes to the lampreys and the less known hags, yet looking to the great differences between such fishes and a shark, it seems better to follow the view of recent systematists and exclude the Monorhina from the class Pisces, making it a primary division of the craniate vertebrates. The name Monorhina has reference to the fact that the nasal sac has only a single opening in the middle line on the head, all the higher vertebrates having two nasal apertures. The skeleton is rudimentary and cartilaginous. The notochord is persistent and uncontracted, and terminates anteriorly in a very small cartilaginous skull. There are no jaws, and the mouth is circular and sucking. A median dorsal fin is present, but there are no limbs. The gills lie at the sides of the

œsophagus in six or seven pairs of branchial sacs. There are two families, Myxiniidae (HAGS) and Petromyzontidae (LAMPREYS).

**MONOTHEISM** (Gr. *monos*, one, and *theos*, God), the belief in or worship of one God, in opposition to polytheism, the worship of many gods, and dualism, the recognition of two equal but opposing forces in the universe. From the records of the past we find that polytheism has universally prevailed among all the great nations of antiquity, and at the present day it still represents the spiritual conceptions of the majority of the human race. The religions of ancient Egypt, Greece, Rome, and Israel were all originally polytheistic so far as the people were concerned; but while in the three former the conception of monotheism was perceived only by a few of the more learned and thoughtful, and was guarded as a secret to be revealed only to the initiated, the people of Israel, through the labours of the prophets, were enabled as a nation to rise to it, and to merge their primitive notion of Jehovah as a tribal or national deity into that of the God of the whole earth. In Christianity we find that the doctrine of monotheism has been sustained and defended from the outset, and in spite of the controversies by which it has been disturbed and rent asunder, the belief in one God has always been supported by the theologians of the church. Even in the most fully developed statement of the doctrines of Trinitarianism the belief in the unity of God is held, undiminished by the conception of there being three persons in that unity. Refusing to accept the Christian doctrine of the Trinity, the Jews have ever strongly insisted upon the essential unity of God, while the monotheism of Mohammed was directed alike against the idolatry of paganism and what he erroneously considered to be the doctrines of Christianity concerning God. Christian Unitarians consider the doctrine of the Trinity to be incompatible with the monotheism taught by Jesus Christ, and therefore reject it as no part of his teaching. See also under GOD and TRINITY.

**MONOTHEISTIC HERESY**, a development or outcome of the heresy of the Eutychians, which admitted two natures in Christ, but only one will (Gr. *monos*, one, and *thelô*, I will). It was condemned by the Council of Constantinople in 680.

**MONOTREMATA** is the lowest order of the class MAMMALIA. This order consists only of two forms, which, though differing considerably from each other, are sharply marked off together from the rest of the class to which they belong. The name Monotremata has reference to the fact that there is a single cloacal chamber into which the rectum, genital, and urinary ducts all open. The monotremes present many characters recalling those of the lower vertebrates. The coracoid bone, which in higher mammals is reduced to a mere process of the scapula, is large and articulates with the breast-bone or sternum; and in front of it is an epicoracoid. In front of the sternum is a large T-shaped bone, the interclavicle, which supports the clavicles. Epipubic or marsupial bones are present. True teeth are absent; but *Ornithorhynchus* is furnished with horny plates which function as teeth. The sutures of the skull are completely obliterated in the adult. The cerebral hemispheres are united by a large



Sternal apparatus of the Duck-bill  
(*Ornithorhynchus paradoxus*).



anterior commissure, and by a very small corpus callosum. The external ear is altogether wanting. The mammae glands have no distinct nipple, the ducts opening through numerous apertures in the skin; the area on which they open is only indicated in *Ornithorhynchus* by the absence of hairs, and in *Echidna* forms a pouch-like depression. In September, 1884, Mr. Caldwell discovered that the monotremes were oviparous. The eggs are large, and like those of birds undergo an incomplete segmentation. Two genera comprise this order, *Ornithorhynchus*, containing the DUCK-BILL (*Ornithorhynchus paradoxus*) and *ECHIDNA*. See Plate MAUSUPALIA and MONOTREMATA.

**MONOTROPEÆ** are a small order of plants belonging to the GAMOPETALÆ, parasitical upon other species, and covered with brown scales instead of leaves. There are ten or twelve species, natives of woods in temperate regions of the northern hemisphere. The flowers are regular. There are two to six sepals, sometimes not to be distinguished from bracts; three to six distinct petals, or a four or five-lobed corolla; and from six to twelve hypogynous stamens. The ovary is superior, four to six-lobed, with only one cell, or four to six cells. The ovules are very numerous, minute, parietal in the one-celled ovaries, or attached at the interior angle of the cell in the four to six-celled ovaries. The fruit is a capsule. The embryo is inclosed within the apex of fleshy albumen.

**MONROE, JAMES** (1758-1831), fifth President of the United States, served as a cadet in the War of Independence, was elected to the first Congress, went to Paris as ambassador in 1797, became governor of Virginia on his return in 1799, and returned again to Paris in 1803 to negotiate the purchase of Louisiana from Napoleon. The price paid was 15,000,000 dollars. After serving several offices in the government he became president in succession to Madison, in 1816. His administration was rendered noteworthy by the acquisition of Florida from Mexico, and by the fixing of the slave-line (lat. 36°30') by the "Missouri compromise." He was re-elected in 1820. He died on Independence Day (4th July), 1831.

The *Monroe Doctrine*, which he enunciated in his second presidency, and which is very frequently referred to as a leading principle of American politics, was a declaration of the determination of the United States not to entangle themselves with European politics, nor suffer the Old World to interfere with the affairs of the New, since any attempt to "extend their system to any portion of this hemisphere would be dangerous to our peace and safety." A great deal of the Monroe doctrine was heard at the time of the fatal attempt of the Archduke Maximilian to found an empire of Mexico, aided by French bayonets, in 1864-67.

**MONS**, the capital of the Belgian province of Hainault, is situated on the river Trouille (by which the city is divided into two parts), at a distance of 38 miles by railway south from Brussels, and in 1883 had 24,466 inhabitants. It is supposed that Mons occupies the site of the Roman station which was so bravely defended by Quintus Cicero against the attacks of the Eburones, the Nervii, and other Gallic tribes (Julius Cæsar, "De Bello Gall," v. 39-52). Mons is entered by five gates. The streets are for the most part wide, clean, and well paved. The Church of St. Waudru, a remarkable specimen of Gothic architecture of the fifteenth century, is one of the finest ornaments of the city. There are several other churches in Mons, of which that of St. Elizabeth is the most remarkable. The other buildings of note in the city are—the town-hall, built in 1440; the tower of the castle, built in 1662; the court-house; the college; the library; the military hospital; the arsenal; and the theatre. Mons has several sugar and salt refineries, soap and starch works, oil-crushing mills, saw-mills, and flour-mills. Woollen and cotton manufactures, cutlery, pins, gloves, and small wares are also made. It is the centre of a very active trade in coals, flax, hemp,

grain of various kinds, millstones, horses, and cattle. The town has communication by railway with all parts of Belgium and France. A canal runs from Mons to Condé, in the French department of Nord, by which it communicates with the Scheldt; this canal was made by the French between 1807 and 1814, for the more ready conveyance of coal. Upwards of 400 pits are worked in the district of which Mons is the centre.

**MONS MEG.** See MEG, MUCKLE.

**MONSOON** (in French *mousson*, from a Malayan word signifying season), a periodical wind which blows over the Indian Ocean between Africa and Hindustan, from October to April from the north-east, and from April to October from the south-west. The region of the monsoons lies a little to the north of the northern border of the TRADE WINDS, and they blow with the greatest force and with most regularity between the eastern coast of Africa and Hindustan. When the sun is in the southern hemisphere a north-east wind, and when it is in the northern hemisphere a south-west wind, blows over this sea. The north-east monsoon extends one or two degrees south of the equator. It becomes regular near the coasts of Africa sooner than in the middle of the sea, and near the equator sooner than in the vicinity of the coasts of Arabia. This wind brings rain on the eastern coast of Africa. The south-west monsoon does not extend south of the equator, but usually begins a short distance north of it. Along the coast of Africa it appears at the end of March; but along the coast of Malabar, not before the middle of April: it ceases, however, sooner in the former than in the latter region. The rainy season on the west coast of Hindustan commences with the first approach of the south-west monsoon, which is supposed to be produced by the great rarefaction of the atmosphere over the vast regions of Eastern Asia during the summer months. The monsoons prevail also on the seas between Australia and China.

**MONSTER**, a prodigy (Latin *monstrum*, that is, *monstrum*, a warning, from *monere*, to warn). Anything of the nature of an omen or portent, any very unusual appearance, in fact anything which might appear to declare the will of the gods, was a monster in the tongue of Rome. Hence the word came especially to be applied like the Greek *teras* to abnormal creatures, fictions of the Greek mythology (which the Romans borrowed, renamed, and absorbed), such as the CHIMÆRA, the SPHINX, the HARPIES, CERBERUS, PEGASUS, &c. Less often it is applied to such poetic and symbolic creations as the CENTAURS, the CYCLOPES, &c. One of the latter, Polyphemus, when Ulysses had succeeded in blinding him during his sleep, is described by Virgil in a famous line as a "horrid monster, shapeless, huge, deprived of sight."

"*Monstrum horrendum, informe, ingens, cui lumen ademptum.*"

Ancient poets used the word, as we still do, also to describe any unusual badness of character. "You monster!" is a not unfrequent epithet in Terence's comedies, and Cleopatra is called a monster by the courtly Horace.

The word has also a technical modern meaning, though for purposes of distinction it is often replaced in the modern sense by the kindred term *monstrosity*.

**MONSTER** or **MONSTROSITY**, in modern science, is the term applied to an individual in whom one or more of the organs or parts of the body proper to the species present some congenital malformation, in consequence of which it differs more or less in appearance and internal structure from other individuals.

Monstrosities were formerly regarded as sports or prodigies of nature, and these ignorant notions with respect to their true character continued prevalent among all classes of people until the commencement of the last century, and are even now held by the uninformed. By the physiologist, however, the study of the various anomalies

of organization in man and animals is now viewed as a branch (and a very important one) of natural science.

Monstrosities may be divided into simple and compound, the first of which only contain the elements of a single individual, while in compound monstrosities the constituent parts of two or more beings are united.

*Simple Monsters* may be again distributed into three classes. In the first of these classes may be included those congenital varieties of conformation which are simple and uncomplicated, only affecting one organ or system of organs, and in most cases not interfering greatly with the performance of any vital function. The second class contains all those cases in which the degree of malformation is so extensive as to produce great alteration in the anatomical and physiological relations of organs, as well as, in most cases, serious external deformity and disturbance of the vital processes. The third class is that of the so-called hermaphrodites, sex being in these monsters imperfectly developed, and both sexes, or some of their characters, being present in one individual.

The development of supernumerary mammae is one of the most frequent anomalies of the first class which occur in the human subject. There is commonly only the addition of one extra gland in these cases, but four and five mammae have been occasionally seen. Many cases of an increase or diminution in the number of the cavities of the heart are recorded, such as three ventricles, absence of both auricles, &c. An unnatural number of teeth has often been observed, and many similar malformations.

The second class of simple monsters, comprising the various forms of extensive malformation, contains an immense number of different cases. Malformation often affects only one region of the body in monsters, the other parts remaining comparatively natural: thus the limbs are frequently very much altered in structure and appearance, and may be even entirely deficient, in cases where the head and trunk preserve almost their regular form. Monsters have been seen in whom the hands or feet were alone developed and inserted immediately upon the trunk. Or again, the trunk may be the principal seat of malformation, while the head and limbs only slightly participate in it. In monsters of this kind eventration has generally been found, accompanied with other anomalies. Eventration consists in imperfect development of the walls of the abdomen, and consequently imperfect retention of the viscera.

It has been observed that whenever serious malformation of the cerebral organs takes place some other parts of the body participate in the anomaly. The brain has often been found imperfectly developed, and situated wholly or partly without the cranial cavity, the walls of which were incomplete.

The last class of simple monsters is sufficiently described by its definition.

*Compound Monsters* consist of those anomalies in which the parts of two or more distinct beings are united in one individual. The two subjects composing a double being may possess an equal degree of perfection, or be very dissimilar in size and structure, one appearing as a mere parasitical appendage of the other; thus two individuals nearly perfect and distinct may cohere together by one region only of the body, or an apparently single trunk may be furnished with two heads or four arms. The multiplication of one or more of the extremities constitutes in fact the first degree of double monstrosity. Beings of this description are sometimes capable of supporting an independent vitality for a considerable number of years if they succeed in coming to the birth, which is naturally far more difficult than usual. The junction of two embryos may take place in almost any region of the body: thus they have been seen attached to each other by the crown of the head, both being placed in a straight line; by the anterior portion of the thorax, or abdomen; or by part

of the front of both, as occurred in the well-known double monsters known as the Siamese Twins, who died in 1873, and the "Two-headed Nightingale," exhibited in London in 1871-72.

Monstrosity, however complicated and extensive, is never carried to such a degree as to remove the animal affected with it out of the series of natural beings in which it has been originally placed; no entire being nor organ has ever been met with so deformed that the species to which it belonged could not be recognized; and anomalies are more frequent in proportion as they do not affect vital organs nor interfere with any important functions.

Similar departures from normal structure occur in plants. For further information upon the subject of monstrosity, the reader may particularly consult Haller's treatise "De Monstris;" Meckel's "Manual of Pathological Anatomy" (German); Geoffroy St. Hilaire's "Anatomie Philosophique;" and Isidore Geoffroy St. Hilaire's "Histoire des Anomalies."

**MON'STRANCE** (Lat. *monstrare*, to show) is the sacred vessel used in the Roman Catholic Church as a depository for the consecrated host. It consists of two parts, the stand and the case in which the host is put—the central part of the latter being of glass or crystal to admit of the host being seen when exhibited to the people, carried in procession, or placed upon the altar in times of special solemnity. The monstrance is often made of the most costly materials, including gold, silver, and precious stones. Before use it is consecrated by a bishop.

**MONT BLANC.** See **BLANC MONT.**

**MONT DE PIÉTÉ** (*Monte di Pietà*, in Italian), a benevolent institution which originated in Italy in the fifteenth century, the object of which was to lend money to necessitous people at a moderate interest. Leo X., some say Paul III., sanctioned the first establishment of a Monte di Pietà at Rome, which was under the direction of a society of wealthy persons, who, having contributed the necessary funds, lent upon pledges small sums not exceeding thirty Roman scudi, a little more than £6 sterling, to each person. Other establishments of a similar nature existed at Milan, Florence, Naples, and most other towns of Italy. That of Padua is one of the oldest on record, having been established in 1491, when the Jewish banks, which lent at usurious interest, were shut up.

This institution was introduced into other countries, especially into the Netherlands, and Monts de Piété were established at Brussels, Antwerp, Ghent, and other places. In Spain there were also similar establishments at Madrid and some other large towns. The Mont de Piété formed the model of the Loan Fund Board of Ireland of 1812-43.

**MONT ST. MICHEL**, an insulated granite rock in Cancale Bay, off the west coast of the south part of the department of La Manche, West France, rising from a wide level expanse of sand, formed in the seventh century by the sweeping away of a forest called Quoquelunde, thus forming an island. It is crowned by an ancient monastery, the top of which is 400 feet above the sea level; and there are various buildings along its base and steep sides. It is best reached from Pontouen, 5 miles south; the sands are bare during the whole day at neap tides, and a causeway was made in 1880 by which it can be reached at all times of the tide. The distance from the shore is a mile; the monastic buildings, formerly used as a reformatory prison, have been greatly improved of late years, and present many points of interest and beautiful architecture. On its site there stood first a Druidical temple; then a Roman temple, and afterwards a Christian church and the Benedictine abbey, founded in 708, and since often repaired. Extensive restorations and improvements were begun by Napoleon III. The buildings of the monastery are flanked by great ramparts and terraces, and the first effect of the rock city is wonderfully picturesque.

**MONTAGNA, BARTOLOMME'O** (1470-1523), a fine painter of the great Italian period, was born at Brescia, but lived for the greater part of his life at Vicenza, where his best works are to be found. His style was founded partly on Mantegna and partly on the great contemporary Venetians, and though not highly characteristic is singularly pleasing.

**MONTAGU, LADY MARY WORTLEY**, by birth Lady Mary Pierrepont, was the eldest daughter of Evelyn, duke of Kingston, by his wife the Lady Mary Fielding, daughter of William, earl of Denbigh, and was born at her father's seat of Thoresby in Nottinghamshire, about the year 1690. In August, 1712, without the consent of her father, she married Edward Wortley Montagu, Esq., eldest son of the Hon. Sydney Montagu, and grandson of the first Earl of Sandwich. Soon after the accession of George I., Mr. Montagu, who had been for some years in Parliament, obtained a seat at the Treasury Board, and from this time Lady Mary resided principally in London, where her wit and beauty immediately won for her a brilliant reputation. In 1716 Mr. Wortley Montagu was appointed ambassador to the Porte, and in August of that year he set out for Constantinople, accompanied by his wife. They remained abroad till October, 1718, and it was during this absence from her native country that Lady Mary addressed to her sister the Countess of Mar, to Pope, and other male and female friends, the celebrated "Letters" upon which her fame principally rests.

Lady Mary's visit to Turkey, besides producing the "Letters," is famous for having been followed by the introduction, through her means, into this country, and thence into the rest of Europe, of the practice of inoculation for the small-pox. Of the next twenty years of her life, which she passed in England, the most memorable incident is her quarrel with Pope, an affair which was long involved in great mystery. Her "Town Eclogues" have been often printed; others of her poetical pieces, or which have been generally attributed to her, are in so free a style as to make it necessary to exclude them from the modern editions of her works. For reasons not well known, she again left England in 1739, but this time without her husband, from whom, however, she seems to have parted on very good terms, although they never met again. She directed her course to Italy, where she lived till 1761, when she was prevailed upon to return to England. She only survived her return to her native country a few months, dying of a cancer in the breast, 21st August, 1762.

A collected edition of her works, under the title of "The Letters and Works of Lady Mary Wortley Montagu," was prepared and published in 1836, by her great-grandson, Lord Wharncliffe, with an interesting life and biographical anecdotes by Lady Louisa Stuart, her granddaughter; but a more comprehensive edition, with much valuable additional information, and a warm defence of her character, by W. Moy Thomas, appeared in 1861.

**MONTAIGNE, MICHEL EYQUEM, SIEUR DE**, born in 1538, was the third son of a nobleman whose estate, from which he took his name, was situated in the province of Perigord, near the river Dordogne. The family is believed to have been of English extraction, originating during the tenure of Aquitaine by the Angevin kings of England. By the death of his two elder brothers Michel became heir to the estate. He was taught nothing but Latin in his early years, and spoke that language long before he could speak French. He was afterwards taught Greek. He studied the law, and in 1554 was made "conseiller," or judge, in the *parlement* of Bordeaux. He repaired several times to court, and enjoyed the favour of Henry II., by whom, or, as some say, by his son Charles IX., he was made a gentleman of the king's chamber and a knight of the order of St. Michel. Montaigne did not interfere in the political discussions of the day, but lived

principally on his estate, from which he derived an income of about 6000 livres. The massacre of St. Bartholomew plunged him into deep melancholy, for he detested cruelty and the shedding of blood. It was about this dismal epoch (1572) that he began to write his "Essais," the first two books of which were published in March, 1580, and met with great success.

His "Journal du Voyage de Michel de Montaigne en Italie, par la Suisse et l'Allemagne, en 1580-81," which was not published until 1774, is one of the earliest descriptions of Italy extant in a modern language.

While he was abroad he was elected mayor of Bordeaux, an honour which he would have declined had not the then king, Henry III., insisted upon his accepting the office. During the war of the League, Montaigne had some difficulty in saving his family and property from the violence of the contending factions. He was a partisan of neither; but in 1588 it appears that he was employed in negotiations for a peace between the Protestant champion, Henry of Navarre, and the Duke of Guise, head of the League and of the Roman Catholic party. He had returned from the baths of Lucca in Italy, where he had resided for some years under treatment for painful internal disorders, to take up his appointment as mayor of Bordeaux, and to help in the healing measure just referred to. He availed himself of his return to France to publish the third book of his essays. Though he took no active part in the strife he showed much political sagacity; he foretold that the dissensions would only cease on the death of one of the great party leaders, and he remarked to De Thou that Henry was inclined to be a Roman Catholic, but was afraid of his own party, while on the other side Guise would not hesitate to embrace Protestantism if he could thereby promote his ambitious views on the crown. In September, 1592, Montaigne fell ill of a malignant quinsy, and died on the 13th of that month, in the sixtieth year of his age. He married in 1566 the daughter of one of his legal colleagues in the Bordeaux *parlement*, and had several children, but all died young save one daughter. He had also an adopted daughter, Mdlle. de Gournay, who became celebrated later on, and who was the first editor of his complete works.

It is a moot point whether, as is alleged, Montaigne invented the title of *Essay* (Fr. *Essai*); but it is quite certain that he gave it the meaning it now has. Since his time that exquisite desultoriness (which a great modern author sought to revive in his "Roundabout Papers") has usually been abandoned in favour of a more definite treatment of the subject in hand, and our modern essay might more often be called a treatise. With Montaigne, however, the text of his essay is merely a starting point. At the first side view he starts away from his main path, and diverges from his new career perhaps to go further afield, perhaps to reach his primitive destination by a charming detour across country. But the real object of the essays is to show us Montaigne himself. He talks with us *à cœur ouvert*; we know all about him, his follies and his wisdom, his superstitions, which are few, and his scepticism, which is great, for he unveils himself to us with a frank uncontrolled egotism beside which Rousseau's "Confessions" is an insincerity. La Rochefoucauld said in his bitter fashion that "lovers always find plenty to talk about, for they talk of nothing but themselves," and it is just this garrulous lover-like intimacy which has endeared three centuries of Western Europe to Montaigne. In addition to this his style is rich in its vocabulary, exquisitely varied, gay, forcible, and dignified by turns. His "Essays" have done much to create modern French.

Montaigne's "Essays" have often been translated, but no translation so well reflects the spirit of the original as the quaint old version by John Florio, dated 1632. Hazlitt republished Cotton's better known translation of nearly half a century later in 1877 with careful notes. A good

sketch of Montaigne by Collins appeared in 1879 in the Foreign Classics Series.

**MONTALEMBERT, CHARLES FORBES, COMTE DE**, a distinguished French author and politician, was born in London, 29th May, 1810, his father being a French gentleman of an old family who had served in the English army, and his mother a Scotch lady, Miss Forbes. Educated at Paris and in Sweden, where his father had been sent as ambassador for France, he began when quite a young man to advocate the claims of Liberal Catholicism in connection with Lamennais and Lacordaire, and he was first brought into public notice by a practical protest which he made against the laws restricting education. He was one of the founders of the *Avenir*, a journal which advocated an alliance between Catholicism and democracy, but which gave offence to the papal authorities, and led to the issue of an encyclical condemning its principles. Montalembert submitted dutifully to the papal censure and devoted himself to the preparation of his "Histoire de Sainte Elisabeth de Hongrie," published in 1836, which suggested the "Saint's Tragedy" of Charles Kingsley. In 1836 he took his seat in the Chamber of Peers, and the same year married Mademoiselle de Mérode, a sister of one of the ministers of Pius IX. During the next few years he held the position of one of the Catholic leaders of France, and his political speeches and pamphlets exerted considerable influence over his countrymen. He accepted the revolution of 1848, and supported Napoleon until after the *coup d'état*, but being disgusted with some of the measures which followed that event, he became one of the most formidable of the moderate opponents of the empire. At the same time he was not forgetful of his higher aims in literature, and he devoted much labour to the preparation of an elaborate historical work, "Les Moines d'Occident depuis St. Benoît jusqu'à St. Bernard," the first volume of which appeared in 1861. Three other volumes appeared between 1861 and 1867, but it was not fully completed at his death. He died 13th March, 1870. Since his death his works have appeared in a complete edition. (See "Mémorial of the Comte de Montalembert," by Mrs. Oliphant, London, 1872.)

**MONTANA**, a territory of the Western United States, North America, chiefly between lat. 45° and 49° N., lon. 104° and 116° W. The Bitter-root range of mountains separates it from Idaho on the west, and the Rocky Mountain range passes through its western districts, Electric Peak, 10,992 feet, being the culminating point in the territory, no part of which is below 2000 feet above the sea-level. The mean elevation of the whole territory is 3900 feet. The greater portion lies within the basin of the Missouri on the east of the main range, and consists of rolling table-lands and plains. A smaller portion on the west is drained by the Clark fork of the Columbia River to the Pacific. It possesses rich gold mines and extensive mountain pastures, but is as yet sparsely occupied; silver is also found, and copper is abundant. Stock-keeping is greatly on the increase. The climate is healthy, with a small rainfall. The chief town is Helena. The area is about 145,000 square miles, and the population in 1880 was 39,157, of whom about 20,000 were Indians. The state was organized in 1864, and it embraces a portion of the great national Yellowstone Park.

**MONTANISM**, the name given to a religious movement which arose in connection with the Christian church during the latter half of the second century. Its founder, Montanus, a Phrygian by birth, began his public work somewhat about the year 156 at Ardaban in Phrygia. He claimed to be moved by the Holy Spirit, and in his character of a prophet he called the members of the church to resist the secularizing tendencies of the times, to practise celibacy as far as possible, to refrain from all second marriages, to fast frequently, to meet persecution without

fright or fear, and to look for the speedy coming of the Lord. Soon the prophet was joined by two women, Prisca and Maximilla, who in their ecstatic frenzies uttered the supposed commands of God and called men to lead strict and holy lives. There is no reason to doubt the sincerity of these three persons, or that the most prominent feature in their mission was a protest against the increasing worldliness of the church, and it is certain that they had no desire in the first instance to separate themselves from it. But as a matter of course the adherents of the new movement were regarded with hostility by the established ecclesiastical authorities, and they soon became involved in contention. In some public disputations the Bishops Zoticos of Kamana, Julian of Apamea, and Sotas of Auchialos, were completely vanquished, but the majority of the bishops decided to break off all communion with the Montanists, and ultimately they were compelled to form a separate organization outside the church. That they exercised considerable influence is evident from the writings of their opponents, while they found an able defender in Tertullian, who joined them about the year 200, and wrote several works vindicating and expounding their principles. Their subsequent history is involved in much obscurity, but their influence seems to have declined rapidly after they had become separated from the church, and they disappear in name at least in the fourth century. (See Bonwetsch, "Die Geschichte des Montanismus," published in 1881.)

**MONTAUBAN**, capital of the French department of Tarn-et-Garonne, is situated on the Tarn, which is crossed here by a fourteenth-century bridge, 32 miles north from Toulouse, and had 24,780 inhabitants in 1886. The gates of the town, the only remains of its old fortifications, are of elegant architecture; the streets are well laid out and clean, and the houses, which are of brick, are in general well built. There is a handsome square in the centre of the town. The walks, from which there is a fine view of the distant Pyrenees, are very attractive. The public buildings most worthy of notice are the fine old cathedral, the town-hall, and the bishop's palace. The manufactures are woollen cloth, kerseymerie, serge, silk stockings and broad silks, starch, and cards for dressing woollen goods; there are also soap-houses, potteries, brandy distilleries, tan-yards, and dye-houses. The town has a good corn-market, and there is also an active trade in wine and leather. The navigation of the Tarn and the Garonne affords ready communication with Bordeaux, from which city Montauban is 110 miles south-east by the Bordeaux and Cetera Railway. There is a theatre and a public library of 14,500 volumes. Montauban is the seat of a bishop; it has theological and communal colleges, a theological seminary for Protestants, a tribunal of commerce, and a consultative chamber of manufactures. It was founded in the twelfth century, and has acquired historical celebrity as the great stronghold of the Huguenots. It was ineffectually besieged by Montluc in 1580, and again by the French in 1621.

**MONTE CARLO.** See MONACO.

**MONTE ROSA**, the second loftiest mountain of Europe, stands at the east extremity of the Pennine Alps, 50 miles E.N.E. of Mont Blanc, on the boundary between the canton of Valais and Piedmont. It is a mass formed by the intersection of two elevated ridges, the one running north and south, the other east and west; and the highest summits are on this north and south axis. It consists of a very lofty ridge, on which are nine principal peaks, which stand in order from north to south thus—Dufour Spitze, or Hôchste Spitze, 15,150 feet, Nordende, Zumstein Spitze, Signal Kuppe, Parrot Spitze, Ludwigshöhe, Schwarzhorn, Balmenhorn, and Vincent Pyramid. The highest peak, a sharp rocky crag or pinnacle, stands on the very sharp icy ridge which connects the Zumstein Spitze with the Nord-

ende or end summit, the second in height. The rock of this highest part is a fine-grained gneiss and a beautiful silvery mica slate, but it seems uncertain whether these may not be altered secondary shales. On the east the range of peaks breaks down in very precipitous slopes into the profound abyss at the head of the Val Anzasca; on the west the ridge of the Lyskamm joins its mass to that of the Matterhorn; while on the north-west Monte Rosa subsides into enormous snow-fields and glaciers, which extend to Zermatt. The ascent is rather difficult, but in good weather free from danger.

**MONTE VIDEO.** This city, the capital of the republic of Uruguay, or, more properly, the Banda Oriental del Uruguay (right shore of the Uruguay River), is situated on the northern shore of the estuary of the great river La Plata, into which the Uruguay flows, opposite to Buenos Ayres, which lies on the southern shore of the La Plata. It is built in the form of an amphitheatre, and its site is a gentle elevation at the extremity of a small peninsula. It was formerly surrounded by regular fortifications, but they have been removed to allow of the expansion of the town. The old citadel is now a market-place, and an English church has been erected in one of the former bastions. The houses are generally well built, of one storey above the ground floor, flat roofed, and floored with brick. There are very few buildings that deserve notice, except the cathedral (which is rather a handsome structure of stone, though inconveniently situated), the castle, the governor's residence, the opera-house, and the custom-house, built in 1873. The harbour is the best in the river Plate. It has from 14 to 19 feet of water, and is fairly sheltered. There is also excellent dock accommodation, to provide which a very large amount of money has been sunk. The dry dock of Baron Mana, opened in 1873, and the larger dock on the other side of the bay, completed in 1878, give ample facilities to the shipping resorting to the port. The city has its public libraries and museum, and the port is in daily communication with Europe by telegraph. The trade is rapidly increasing, chiefly in consequence of the large numbers of sheep which are now kept in the surrounding country. The exports are chiefly hides, wool, tallow, sheepskins, jerked beef (to Havannah and Brazil), and Liebig's Extractum Carnis, or extract of meat. The imports consist principally of English manufactured goods. The climate is healthy, though moist; the heat of the summer is oppressive. The soil of the neighbouring country is fertile, affording pasture to immense herds of sheep and cattle. The town itself is ill supplied with water, is an extremely expensive place in which to live, and consular reports frequently warn British artisans against settling there.

**MONTFIORE, SIR MOSES,** a distinguished patriot and philanthropist, was born of English parents belonging to the Jewish race and religion, 24th October, 1784, at Leghorn. He was brought up in England, and after a prosperous business career on the stock exchange he retired into private life soon after the age of forty, and for the remainder of his days devoted himself to acts of benevolence, which became famous throughout the civilized world. In 1827 he visited Palestine, and finding the Jews there in a state of deplorable misery he exerted himself with wonderful energy and success to ameliorate their condition. He interested the British government on their behalf, provided them with schools, gardens, and houses, and did his utmost to raise them from the degraded condition into which they had fallen. In 1840 he visited Constantinople, and successfully defended the Jews from the charge of shedding human blood at the Passover, obtaining from the sultan the celebrated firman of the 12th Ramazan, A.H. 1256, which refutes this slander, declares the equality before the law of the Jewish people with the other subjects of the Commander of the Faithful, and for-

bids their molestation. By the advice of Sir Moses the Turkish language was taught in the Jewish schools throughout that country, a measure which has done much to raise the Jews in social and political influence there. His next mission was to Russia, where he obtained from the Czar Nicholas the repeal of an oppressive edict against his countrymen; and in 1858 he endeavoured unsuccessfully to regain for its parents the Jewish child Mortara, who had been surreptitiously baptized and stolen from his mother at Rome. In 1860 he was the means of sending large sums to the relief of the Christians of Syria, who had been attacked by the Druses, and three years later he visited Morocco to plead with its sultan on behalf of his countrymen. In addition to a second journey to Russia and one to Roumania, he visited Palestine seven times in all, each visit being attended by marked improvements in the lot of the Jews there; and when the blood accusation was laid against the Jews of Tisza Eszar, he wrote to every member of the Hungarian legislature exposing its falsity. His benevolence was, however, by no means restricted to his coreligionists, but was liberally and wisely bestowed in many directions among Christians also, both at home and abroad. In 1837 he was elected sheriff of London, and as sheriff at the coronation was knighted by Queen Victoria. In 1846 he was made a baronet. The completion of his hundredth year was made the occasion of world-wide congratulations on 21st October, 1884, and at Jerusalem and throughout the world the Jews held special services in his honour. He died at his residence near Hainsgate, 28th July, 1885.

**MONTENE GRO,** a sovereign principality and the smallest independent territory in Europe, has an area of about 3550 square miles, and a population of 250,000, including the town and district of Dulcigno on the Adriatic. Exclusive of the latter, which is inhabited by a people to a great extent alien in race and character, but which provides a sea outlet for trade, Montenegro consists of a mountainous district, forming part of the high land of Albania, and situated on the borders of Herzegovina, and on the east of the Austrian territory of Cattaro. The country is a succession of high rugged limestone ridges diversified here and there by lofty peaks (of which Mount Dormiton in the north, and Kutch Korn in the east, are 8500 and 9300 feet above the sea respectively), and in some parts looking "like a sea of immense waves turned into stone." Between these ridges high valleys slope down to the south-east, drained by two streams, the Schiniza and the Ricovernovich, both affluents of the Lake of Scutari. From the dark appearance of its once pine-covered hills it derived the name of Czernagora, or Black Forest, whence its modern name, Montenegro, Black Mountain; and its rugged aspect may be inferred from the traditions of the people, who say that "when God was in the act of distributing stones over the earth, the bag that held them burst and let them fall upon Montenegro."

The soil of the valleys of Montenegro is not very fertile; it produces maize, potatoes, and tobacco principally. Agriculture is very primitive. The land is generally cultivated with the spado, and in many places it consists of the merest patches on the mountain sides. The plain of the Zeta is the most fertile portion, and the extension of territory in this direction given in 1878 was for Montenegro its most valuable acquisition. Meagre as was its cultivable area prior to this addition, Montenegro had an agricultural school, the first of the kind established in the lands of the Slav around Turkey.

The wine of the district between Lake Scutari and Dalmatia is of good quality. Fish, which are plentiful, are exported in a dried state, with hides, wool, mutton, bacon, and lard. There is good pasturage and abundance of timber, the hillsides being generally covered with fir, ash, beech, oak, and poplar, and the sumach tree is common. The climate is healthy, and the inhabitants are hardy,

robust, and brave. They are Slavs of the Servian race, and their language is a pure dialect of the Slavic. Until 1851 the prince's predecessors were both spiritual and temporal rulers, but in that year the reigning prince threw off his spiritual and religious authority and assumed the title of Hospidar. The executive authority rests with the reigning prince, while the legislative power is vested, according to an administrative statute proclaimed 21st March, 1879, in a State Council of eight members, one-half of them nominated by the prince and the other elected by the male inhabitants who are bearing or have borne arms. Practically, all depends on the absolute will of the prince. Justice, however, is well administered, but all who have, or think they have, suffered wrong can go direct to the prince, at the Tree of Justice, and he will either decide the case himself or will direct a new trial.

The prince's nominal yearly income is fixed at 9000 ducats, or £4100. No official returns are published regarding the public revenue and expenditure. Reliable estimates state the former at 600,000 Austrian florins, or £60,000. A loan of 1,000,000 florins was raised in Vienna in 1881 at an interest of  $6\frac{1}{2}$  per cent. on the salt monopoly of the principality. Schools for elementary education are supported by government; education is compulsory and free. All males under the age of twenty-five years are supposed to be able to read and write. There is a theological seminary at CETINJE, the capital. Some progress is being made in the construction of roads, but the only manufactures are coarse woollens, agriculture and fishing forming the principal occupations of the people. Mules and asses are the beasts of burden. A treaty of commerce has been concluded between Montenegro and Great Britain. Under it all English goods are imported free of duty into Montenegro, the Montenegrins only reserving to themselves the right of levying a *maximum* duty of 8 per cent. The habits of the people are extremely primitive, and their villages are mere collections of mud hovels, even Cetinje consisting of little more than a mere straggling street. For all this, however, Montenegro was one of the first European countries to possess a printing press, one having been introduced in the fourteenth century. Although priding themselves upon their strictly orthodox Greek faith, other religions have every liberty.

*History.*—The old Servian Empire, of which Czernagora originally formed a part, was broken to pieces at Kosova in 1389, and sooner or later all the shattered portions, except Montenegro, were then subjugated and absorbed in the great Moslem Empire. That such a fate failed to overtake the men of the Black Mountain was due in a great measure to the strong natural defences formed by the rugged and inaccessible character of their country. Here in their mountain fastnesses the Montenegrins, through five long centuries, held aloft the banner of Slavo-Serb liberty, and though sometimes overborne by numbers or treachery, it never fully submitted to Mussulman rule. The history of few countries presents such a record of constant and almost unceasing strife as that involved in this maintenance of Montenegrin freedom. In 1862 an overwhelming Turkish army invaded the principality, in consequence of its participation in an insurrection in the Herzegovina, appeared before Cetinje, and compelled its prince to give a formal submission to the sovereignty of Turkey; but in 1874-75 Montenegro threw in its lot with Bosnia, the Herzegovina, and Servia, in their revolt against Turkey, and on the patching up of a peace with Servia, the struggle was maintained single-handed by Montenegro. Suleiman Pasha marched through the country, and probably would have occupied Cetinje, but for the outbreak of war with Russia in 1877, which necessitated the withdrawal of most of the Turkish troops. At the Congress of Berlin Prince Nicolas was confirmed in possession of a

considerable part of the territory he had been able to conquer from Turkey, and it was stipulated that the sultan should recognize the independence of Montenegro.

**MONTESQUIEU, CHARLES DE SECONDAT, BARON DE LA BRÈDE ET DE**, was born on 18th January, 1689, at the Château de la Brède, in the neighbourhood of Bordeaux. He attained the rank of councillor in the *parlement* of Bordeaux in 1714, and three years afterwards succeeded at the same time to the fortune of a paternal uncle and to his post of *président à mortier* in the same *parlement*.

With the most assiduous and conscientious discharge of his duties as a judge he united the enthusiastic pursuit of literary studies. In 1716 he had become a member of the Academy of Bordeaux, and about this time wrote his "Physical History of the Ancient and Modern World," which was published in 1719. In 1721 appeared his lively "Lettres Persanes," foundation of the school called the *philosophes*. His classical romance, called "Le Temple de Guise," was published in 1725, after which year Montesquieu devoted himself entirely to literature. He was elected a member of the French Academy, and shortly after set out on an extensive course of travels, devoting two years solely to England, for which country, and especially for its laws, he conceived a great admiration. On his return to France he spent two years in studious retirement in the country. He published in 1734 his famous work on the causes of the "Greatness and Decline of the Romans;" and immediately after commenced the "Esprit des Loix," which did not see the light until 1748. He wrote nothing great afterwards, but was a tolerably diligent contributor to the earlier volumes of the famous *Encyclopédie*. Montesquieu died at Paris in 1755.

Montesquieu must be held the greatest Frenchman in literature of the eighteenth century. Even Voltaire cannot compare with him; as he has a depth and originality to which the more brilliant writer can lay no claim. In the "Lettres Persanes" he even rivals Voltaire in *persiflage* and gay witty treatment of serious subjects, while his tone of thought is always superior in refinement. Above all the rest Montesquieu towers by a head and shoulders. The "Esprit des Loix," which deals with the effects of surrounding circumstances, climate, territory, &c., upon laws and customs, and reasons out the best modes of government from these considerations, is one of the great books of the world. It created a new political science, and made an epoch.

**MONTEVERDE, CLAUDIO**, a musical composer of the very highest importance in the history of the art, was born at Cremona in 1568. He was one of the string band of the Duke of Mantua, but soon made his fame as a composer. For two reasons, because he was very daring and original, and also because he never thoroughly became at ease in the old contrapuntal style of writing, Monteverde cast aside many restrictions, and gradually developed what we regard as the beginnings of modern music. In especial he is to be regarded as the first to use sevenths as unprepared chords, a most startling innovation, and one which roused a storm of opposition from his brother musicians. After writing much madrigal music of fine quality and some ecclesiastical compositions in the strict style, of not very great merit, Monteverde produced his opera of "Arianna" in 1607, and his still greater work of "Orfeo" in 1608. It is most remarkable to observe how the Wagnerian school is here foreshadowed by, among other peculiarities, the careful use of a certain combination of instruments to accompany each principal actor, &c.

In 1618 Monteverde took service with the republic of Venice, composing the church music for St. Mark's, while not neglecting higher studies also. He quickly rose to the greatest celebrity as a musical composer, and retained his pre-eminence till his death in 1643. Ten years before that he had taken orders in the church.

While we must be grateful to the immense genius of Monteverde for freeing music from the shackles of pedantry, we must always regret that he did not earlier discover his true bent. Had he written nothing but his fine operatic works, and invented his dramatic vocal and orchestral effects (the *tiemolando* of violins, for instance, we owe to him), we might have reaped all the advantages we now enjoy, and yet at the same time have preserved the antique beauty and the stern severity of the fine madrigalian school which he overthrew. Unfortunately he was a revolutionary instead of a reformer, and his genius was so great that his will was irresistible.

**MONTEZ, LOLA**, a personage of considerable notoriety in her day, was born at Montrose in Scotland, in 1820, and appeared first at Warsaw as a dancer in 1839. She had engagements at various capitals, and finally at Munich in 1846, where she attracted the notice of the King of Bavaria, who withdrew her from the stage, gave her letters of naturalization, created her Countess of Landsfeld, and adopted her as his mistress. She plunged at once into politics, made and unmade ministries, brought her life and her lover's throne into serious danger, and had eventually to be banished from Bavaria, 11th March, 1848. She retired to England, thence after some years to California. She visited Australia in 1855, and died at New York in 1861.

**MONTFORT, SIMON DE, EARL OF LEICESTER**, a great English political leader, was a descendant of an old French family, and was the fourth and youngest son of Simon, count de Montfort, the cruel conqueror of the Albigenes. He was born in France about 1206, came over to England about 1230, and though for a time he remained in poverty and obscurity, he ultimately gained the favour of Henry III., who restored to him the earldom of Leicester, of which his father had been deprived, and gave him the hand of his sister, the Countess-dowager of Pembroke, in marriage. A bold and ambitious man, he began very early to take a prominent part in the discussions which then convulsed the kingdom, gaining a vast influence in the country, and becoming a favourite with the common people as well as the barons. He was alternately the object of regard and dislike on the part of his fickle and imprudent sovereign, by whom he was expelled the court, then recalled and made seneschal of Gascony, where he did the king good service for six years, and was then once more disgraced and banished, and afterwards recalled and employed. In 1258, when the king was compelled to swear to the Provisions of Oxford, De Montfort was placed by the barons at the head of the council. In 1261 Henry repudiated the oaths he had taken, and civil war broke out. Ultimately the whole dispute was referred to Louis IX. of France. The award of Louis was in favour of the king, and this led to a renewal of the strife. In May, 1264, Leicester completely defeated the royal army at Lewes. took Henry and his brother prisoners, and compelled the princes Edward and Henry to surrender themselves into his hands. By this victory the government of England fell into the power of the barons, and Leicester, moving up to London, summoned in the same year a parliament composed of the barons of his own party, of several ecclesiastics, and two knights returned by each shire. The principle of representative government received a further development in 1265, when borough members, as distinguished from county members, were for the first time summoned. It is this action of De Montfort which, more than any other, has given him his place in English history. His colleague Gloucester took offence at his conduct, and went over to Roger Mortimer and Prince Edward, so that De Montfort found himself placed in a position of immense difficulty. He gathered a strong force and marched against his enemies, ordering his son Simon to join him with additional forces from London. The latter, while on his way, was surprised

and defeated by Prince Edward at Kenilworth, and the royalists then attacked De Montfort at Evesham. Out-numbered and overmatched the old earl fought stoutly, but was in the end overpowered and slain. His body was afterwards mangled and dismembered, but he was long revered by the clergy and the people as a saint and martyr, and miraculous virtues were ascribed to his relics. He undoubtedly possessed great capacity both for war and government, and his character has been depicted in a very favourable light by modern historians. (See Prothero's "Life of Simon de Montfort," London, 1877.)

**MONTGOMERY** is a county of North Wales, bounded N. by Denbighshire, E. and S.E. by Shropshire, S. by Radnorshire, S.W. by Cardiganshire, and W. and N.W. by Merionethshire. Its length from north-east to south-west varies from 23 to 40 miles; its breadth from 19 to 33 miles. The area is 773 square miles. The population in 1881 was 65,798.

The surface of the county consists of bleak moorlands of Upper and Lower Silurian slate, with some sheltered woody sales near the English border. The north-western border towards Merionethshire is occupied by the Berwyn Mountains, which form two branches inclosing the valley of the Dovey, but the south-eastern branch belongs in a great degree to Montgomery. It separates the basin of the Dovey from that of the Severn. Irregular branches from these two principal chains occupy the intermediate part. Plinlimmon belongs to the Berwyn chain, and is partly in this county, but its summit (2481 feet) is just within the border of Cardiganshire. The county is almost entirely occupied by the slate rocks which overspread so large a portion of Wales, but granite, greenstone, conglomerate, and the new red sandstone also occur in different places. The mineral treasures are not very abundant. Lead, zinc, and copper are procured.

The Severn is the principal river of the county; it rises just within the border towards Cardiganshire, on the eastern side of Plinlimmon, and flows east about 12 miles to Llanidloes, whence it flows north-east about 38 miles to the junction of the Vyrnwy on the border of the county, a little below which it enters Shropshire. The Severn receives the Tiranion, 12 miles long, the Afon Garno, 12 miles, the Mule, 11 miles, the Rhiw, 18 miles, and the Camlet, 20 miles. That part of its course which lies in Montgomery or on the border is about 51 miles long. The Vyrnwy receives a number of small streams, and flowing south-east passes Llanfair; it then turns north-east, and after receiving the Tanat, joins the Severn near the borders of Shropshire; its whole course is about 45 miles. The southern part of the county is watered by the Wye, which rises on the south-east side of Plinlimmon, about a mile from the source of the Severn, and flows south-east 14 miles into Radnorshire. The Dovey chiefly belongs to Merionethshire. It enters Montgomeryshire about 4 miles below Dinas-y-Mowddly and flows about 10 miles to the neighbourhood of Machynlleth, where it again touches Merionethshire. Its remaining course traverses Merionethshire, Montgomeryshire, and Cardiganshire. The Severn and Dovey are the only navigable rivers. The Montgomery Canal passes through the county, and it is also traversed by the Cambrian Railway and its branches.

The state of agriculture differs little from that of the adjacent counties, and as in them grazing and pasturage are gaining ground over tillage. The cattle and sheep are both small and hardy. In the hilly districts great numbers of hardy ponies, called "Merlins," are reared. The only manufactures are coarse woollens and flannels at Newtown, Welshpool, and other places.

Montgomery is divided into nine hundreds. The greater portion of it is in the diocese of St. Asaph, the remainder in those of Hereford and Bangor. It is in the North Wales circuit. The county returns one member to Parliament, and



one is also returned for the borough of Montgomery and some contributory towns, having a total population of 19,625.

**History and Antiquities.**—Montgomery was, with the neighbouring counties, included, during the period of British independence, in the territory of the Ordovices, and on the reduction of the island under the Roman power in the province of *Britannia Secunda*. After the withdrawal of the Romans we hear nothing of this county for many years. In the year 894, however, in the reign of Alfred, the Danes made an irruption. Hastings, or Hasten, or Hesten, their leader, had invaded the eastern parts of England; and in his third campaign, in 894 or 895, he intrenched himself at Buttington, on the east bank of the Severn, close to Welshpool. There he was besieged by Alfred's thanes, until, reduced to desperation by famine, he broke through the blockading force, and with fearful loss returned to his former quarters on the east side of the island. A portion of the eastern part of the county, cut off by Offa's Dyke, was included in the territory of the Saxons. The rest was included in Powys or Powysland. After the Conquest Powys became the continual object of attack by the Norman lords of the marches or frontiers. These hostilities led to the erection of the castles of Montgomery by the Normans, and Powys, near Welshpool, by the Welsh, and to a continued and severe struggle for the possession of these strongholds. The independence of Powys was overthrown before the final subjugation of North Wales; it was constituted an English lordship, which became extinct in the reign of Henry VIII. The only remaining castles, or ruins of castles, are those of Montgomery and Powys. There are no monastic remains of any consequence in the county.

MONTGOMERY, the chief town of the above county, and a parliamentary borough, is situated on the river Severn, 168 miles north-west of London by road, or 189 miles by the Cambrian Railway. The parliamentary limits are co-extensive with the parish. The population in 1881 was 1194. The town, situated on the ascent of a hill, on the east bank of the Severn, near Offa's Dyke, is very healthy. Its streets are steep, but clean; and the houses well built. The principal buildings are—St. Nicholas' cruciform church, in the Early English style, which was restored in 1868 at the expense of the Earl of Powis; two chapels; town-hall, with court-house and assembly rooms; savings bank; and Edward's school. There is no trade of any importance. On the hill are some remains of the feudal castle built by Roger de Montgomerie, a Norman baron, from whom this place derived its name. In the vicinity is a Celtic camp. There are traces also of the old town walls. Its Welsh or British name is *Froed-falldwyn*, or Baldwin's Town. The last battle between the Welsh and the English took place in the vicinity in 1294. The famous Lord Herbert, celebrated alike for his chivalry, wit and learning, was born here in 1581.

**MONTGOMERY**, the capital of Alabama, in the United States, is a large and thriving town. The population in 1880 was 16,713. Large quantities of cotton are exported hence by steamers to Mobile, *via* the river Alabama, on the banks of which Montgomery is built. A railway connects this place with Milledgeville, forming part of the great line of communication between New York and New Orleans. It possesses an important state-house, numerous churches, and important industrial institutions. It was the capital of Secession previous to Richmond.

**MONTGOMERY, JAMES**, a poet of deservedly high reputation, was the son of a Moravian minister, and was born at Irvine in Ayrshire, 4th November, 1771. He was educated at the Moravian school of Fulneck, near Leeds. After spending some time as an assistant in a chandler's shop, and then as a clerk to a bookseller in London, he obtained employment in 1792 as an assistant in a newspaper office in Sheffield. In a short time he

became the editor and proprietor of the journal, changing its name from the *Sheffield Register* to the *Iris*. In 1794 he was tried, at the instigation of the government, on a charge of having printed a ballad written by an Irish clergyman on the demolition of the Bastille in 1789, and being found guilty was sentenced to three months' imprisonment and to pay a fine of £20. In the following year he was again tried, imprisoned, and fined for inserting in his paper a paragraph reflecting on the conduct of a magistrate in quelling a local riot. All the persons concerned in these prosecutions, however, ultimately manifested their esteem and regard for the poet. His first volume of poetry, "The Wanderer of Switzerland, and other Poems," appeared in 1806. His next production was "The West Indies," written to accompany a series of engravings published as a memorial of the abolition of the slave-trade. This was followed by his "Prison Amusements;" "The World before the Flood" (1818); "Thoughts on Wheels" (1817), directed against state lotteries; "The Climbing Boy's Soliloquy," a description of the sufferings of chimney-sweepers' apprentices; "Greenland" (1819), in five cantos; and "The Pelican Island," his last and perhaps best long poem. His collected poetical works appeared in four vols. 12mo in 1841, and in one vol. 8vo in 1851; his "Original Hymns for Public, Private, and Social Devotion" were published in 1853. For some years before his death he enjoyed a pension from government of £200 per annum. He died 80th April, 1854, in the eighty-third year of his age. His poetry is characterized by depth of feeling, simplicity of taste, purity and felicity of diction, and picturesque beauty, as well as by sincere, simple, and unsectarian piety. Many of his hymns are justly valued by English Christians irrespective of denomination. He must not be confused with the absurd poetaster Robert Montgomery, about contemporary with him. Macaulay's happiest piece of satire is that scathing criticism of "Mr. Robert Montgomery's poems" which has delighted a generation of admirers, besides having settled the victim's literary pretensions for ever.

**MONTICULES** are the small adventitious cones that form on the sides and around the base of an active volcano. They are produced by the fissuring of the crater and escape of lava, &c., through the aperture so formed.

**MONTLUÇON**, a town of France, in the department of Allier, 50 miles W.S.W. of Moulins by rail, situated on the right bank of the Cher, which is crossed by a fine stone bridge. It is an old town surrounded by walls, which separate it from the faubourgs, and on account of its industrial importance has been called the Manchester of France. The population in 1882 was 25,220. It has a tribunal of first instance, a college, a town-hall, and an hospital. Its manufactures embrace glass, steel, iron, and wool, and it has extensive saw-mills and lime-kilns. In the neighbourhood are the Commeny coal mines and the celebrated wells of Nérès-les-Bains.

**MONTPELLIER**, capital of the French department of Hérault, is situated on a hill near the Lez, at a distance of 30 miles by railway south-west from Nîmes, 20 north-west from Cette, its port, and had a population of 48,729 in 1882. Montpellier was built in the tenth century to replace the episcopal town of Maguelonne, which stood on an island in a neighbouring lake, and had been destroyed by order of Charles Martel for favouring the Saracens. It is situated on an eminence, from which there is an extensive view over the Mediterranean and the adjacent coasts. The streets were formerly all narrow, crooked, and steep, but some of them have been enlarged and new ones laid out. The houses, which are almost all of stone, are substantially built. Most of the squares are small and of irregular form; the public fountains are numerous. There are two town-walks—the esplanade between the town and the citadel, and the Peyrou, a splendid terrace-walk



planted with trees and covered with turf. On the upper part of the terrace stands a hexagonal tower adorned with columns, and inclosing a reservoir, which is furnished with water by an aqueduct about 5 miles long. The water from this reservoir falls in a cascade over artificial rocks, and supplies the various fountains of the city. The cathedral presents little that is worthy of notice. The former amphitheatre of St. Côme, now the exchange, is adorned with a handsome Corinthian portico, and is perhaps the handsomest building in the city. The modern anatomical theatre is a fine building, and the gate of Peyrou, a triumphal arch opening on the promenade of Peyrou, is also handsome; but the former episcopal palace, now occupied as a medical school, the court-house, the prefect's house, &c., are of ordinary appearance.

The manufactures of Montpellier are considerable, and business is prosecuted on a large scale. There are several banking-houses. Liqueurs, perfumery, preserves, dried fruits, verdigris, alum, cream of tartar, vitriol, and aquafortis, woollen cloth, muslins, printed cottons, calicoes, table linen, blankets, hosiery, hats, leather, corks, paper-hangings, and surgical instruments are manufactured. These articles, with wool, wine, brandy, oranges, citrons, and other fruits, and the oil of the surrounding districts, furnish the chief articles of trade. There are several printing offices, sugar refineries, potteries, oil-mills, paper mills, and saw-mills. In the central prison several articles of silk and cotton are manufactured.

Montpellier is the seat of a bishop. It has a handsome Palais de Justice. There are also a tribunal of commerce, an exchange, an eminent medical school, a college, a theological school, a splendid picture gallery and library, called the Musée Fabre (the latter containing 50,000 volumes), a Protestant church, a synagogue, several hospitals, barracks for 2000 soldiers, a Mont-de-Piété, a botanic garden, and many scientific and educational institutions. The character of the town as a health resort, which led the illustrious Locke, when suffering from asthma, to make a tedious journey thither in the days of Charles II., is for the present not considered to be upheld.

**MONTREAL**, the second city and river port, and the chief seat of the commerce of Canada East, is situated on the south side of the island of Montreal, and had 140,863 inhabitants in 1881. It was founded in 1640 on the site of Hochelaga, an Indian village at the foot of Mont Royal, the name given to it by its French founders, which has since been corrupted into Montreal. The island of Montreal (82 miles in length and 10 in breadth) is in the middle of the river St. Lawrence, and forms a county divided into two ridings, each of which sends a member to the colonial Parliament. Montreal itself is separated into an upper and a lower town; the latter, along the river, being the trading quarter, and the former the residence of the principal merchants. The streets are wide; the houses large, commodious, and well built. The Roman Catholic cathedral, one of the largest churches in America, is capable of containing nearly 10,000 persons; it is a fine building 255 feet in length by 184 in breadth, faced with stone, and having two towers, each 225 feet high. There are several other Roman Catholic churches and most extensive conventual and monastic establishments—the latter comprising the Hotel Dieu, and asylums of the Gray and Black Nuns. A Church of England cathedral has been erected at an expense of £20,000; St. Andrew's Scotch church, a Gothic structure which cost £10,000; several other American Protestant places of worship, a general hospital, government house, several banks, the ordnance office, barracks, prison, theatres, merchants' exchange, four market-houses, and the statue of Nelson on a Doric pillar, are also conspicuous structures. The city, which is the seat of a Roman Catholic bishop, has a French college, a university founded in 1821, a Roman Catholic theological school, a royal

grammar-school, and several classical and scientific academies, public libraries, and institutions. The climate of Montreal is rather severe in winter, but in summer the heat is not excessive, the mean temperature of the year being 45° 8'—in winter 17° 8', and in summer 71° 4' Fahr.

The Mount Royal Cemetery is finely situated on the north slope of that mountain, 2 miles from the city. The water supply has been brought by a magnificent aqueduct, 5 miles long, from the St. Lawrence, above Lachine Rapids. There is railway communication with New York, Boston, Portland, &c. The Victoria bridge, conveying the line of the Grand Trunk Railway of Canada, which crosses the St. Lawrence at this point, was commenced in 1854, and opened with great pomp by the Prince of Wales in 1860. It is tabular, like the Britannia Bridge in North Wales, but 9184 feet, or nearly 2 miles long, and rests on twenty-four piers and two abutments of solid masonry; the central span being 330 feet. This magnificent bridge completes the chain of railway communication between the Atlantic and the Western states of America. Montreal has also most extensive canal communication.

The solid limestone quays of Montreal, uniting with the locks and wharves of the Lachine Canal, present several miles of continuous masonry, and a broad terrace divides the city from the river through its entire extent. The commerce in furs has declined, but there is an increasing trade in grain, cast-iron founding, distilling, brewing, and shipbuilding; there are also many factories for soap, candles, tobacco, hardware, and floor-cloth. By deepening the shallower parts of the river above Quebec, Montreal is accessible for vessels drawing from 19 to 22 feet of water. Its harbour is 90 miles from the influence of the tides.

Montreal is 140 miles south-west of Quebec, 400 from New York, and 2750 from Liverpool. While the river is open there is weekly steam communication with the latter port. After the navigation of the St. Lawrence is closed by ice the steamers find a harbour at Portland, Maine, which is 292 miles from Montreal.

**MONTROSE**, a royal burgh and seaport of Scotland, in the county of, and 21 miles east by north from Forfar, and 522½ from London by the Great Northern and Caledonian Railways. It is situated at the mouth of the South Esk River, between the large loch or basin of Montrose and the sea, and is a remarkably neat town. In ancient times it was a place of considerable strength, surrounded by walls. The principal streets, which are wide and regular, extend from north to south. The houses are substantial and in some localities elegant. Some of the old ones present their gables to the street. Water is well supplied in pipes from a distance of 3 miles on the western side. The town is well paved and cleansed, and has excellent drainage. The river is crossed by a handsome chain suspension bridge, 432 feet long, which connects the town with the suburb of the Inch on the south side. It has several times suffered injury through storms and defects in material. The river is also crossed by a stone bridge and a viaduct erected in 1882-83. On the east are some Links or Downs, on which horse races were formerly held, but which now supply an admirable golfing field. The parish church, in the middle of the town, is one of the largest in Scotland, with a steeple 200 feet in height. An episcopal chapel and a chapel of ease are each commodious and neat places of worship, and there are three Free churches, three United Presbyterian churches, and Independent, Evangelical Union, and Wesleyan churches. A custom-house, a town-house, prison, theatre, and post-office, two large lunatic asylums, hospital, museum, infirmary, and dispensary are the principal public buildings. Numerous bequests of benevolent persons form a poor's fund, amounting to upwards of £10,000. There is a public academy, town library, and numerous schools. The manu-

factures consist chiefly of flax-spinning and weaving. There are also bleaching yards, breweries, tanneries, saw-mills, sailcloth, soap and starch factories, and manure and chemical works. The Montrose herring, cod, and ling fisheries are important, employing about 700 bounts and 1600 men. The number of vessels registered as belonging to Montrose in 1888 was fifty (9000 tons). The entrances and clearances each average about 550, of 80,000 tons per annum. The trade is almost entirely coastwise. The principal exports are manufactured goods, salmon, stone, and agricultural produce to London, Glasgow, Leith, and Dundee, and the imports coal, lime, slate, and iron. The harbour is formed by a breastwork at the mouth of the river, within which vessels of large size can anchor, there being 18 feet of water on the bar at low tide. Altogether it is one of the best on the east coast of Scotland. The population of the municipal burgh in 1881 was 16,280; of the parliamentary, 14,973; of the parish, 16,303.

In Gaelic the name of the town is *Alt-moine roa*, "the burn of the mossy point." It was created a royal burgh by David I. in the twelfth century. It was the first port reached by the French fleet in 1715, with the Pretender on board; and the same personage sailed from it in February, 1716. The town was long celebrated for its schools. It was the first place in Scotland in which Greek was taught, and it has preserved the character which it so early (1534) attained. Montrose was the birthplace of the gallant but unfortunate cavalier, James Graham, first marquis of Montrose. Joseph Hume, the financial reformer, was also born in the town, and a statue has been erected to his memory.

**MONTROSE, JAMES GRAHAM, MARQUIS OF,** born 1612, was descended from one of the most ancient families in Scotland. He was educated at St. Andrews, and in his seventeenth year married Magdalene Carnegie, daughter of Lord Carnegie of Kinnaird. After travelling for a time on the Continent he appeared at the English court in 1636, but being coldly received by Charles I. he returned to Scotland and attached himself to the popular party. In 1638 he was one of the four noblemen selected to draw up the National Covenant of Scotland, and the following year he made three military expeditions against the royalists. In 1640 he was the first man in the army of the Covenanters to ford the Tweed in the march against Charles. He had, however, already begun to hold secret communication with the king, and though suspected, and even arrested, he managed to escape and take service under Charles. In 1644, having been raised to the rank of marquis, he was sent to Scotland to raise the royalists on the king's behalf, and at the head of 1200 Irishmen and the fighting men of several of the Highland clans, he gained a series of brilliant victories which culminated at Kilsyth (6th August), and made him for a time virtually master of the country. The following month, however, he was defeated at Philiphaugh, and escaped with difficulty from the field at the head of a few followers. After a vain attempt to raise the clans again he sailed in September, 1646, for Norway. He remained abroad until 1650, when, having accepted a commission from Charles II., he set out for the Orkneys, from whence he passed to the mainland. In his first encounter he was utterly routed by Colonel Strachan, and after being nearly starved in the wilds he fell into the hands of General Leslie, by whom he was brought to Edinburgh. On the 20th May, 1650, he was condemned to death, and on the 21st was hanged, meeting his death with the utmost courage and dignity.

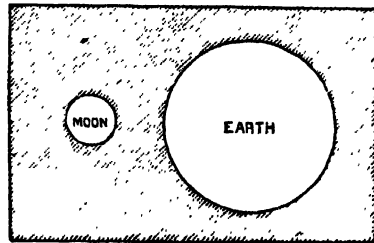
**MONTSERRAT**, a British West Indian island, one of the Leeward group, about 80 miles south-west from Antigua, is about 12 miles long and 7 broad. Its area is 47 square miles; and the population is 9000—four-fifths being blacks. The island is of volcanic origin; the mountains are in many places quite inaccessible, rising to 2500 feet above the sea, and are separated from each other by

almost perpendicular chasms, which, as well as the sides of the hills to their summits, are clothed with a luxuriant vegetation, including both lofty trees and tropical shrubs. On the south-west side, at a height of 1000 feet from the level of the sea, there is a boiling sulphurous spring. This island is one of the most beautiful in the West Indies, and the climate is exceedingly healthy. The soil is light, and produces some of the best coffee and sugar; the crop of the latter, which is the principal product, amounting to about 2000 hogsheads annually. Cotton, wool, arrow-root, and tamarinds are also exported. The government is administered by a president—who is subordinate to the governor of the Leeward Islands—aided by an executive council appointed by the crown, and a legislative assembly of twelve members, of whom eight are elected and four nominated by the crown. There is a public debt of about £5000.

The island was discovered and named by Columbus in 1593. He called it Montserrat from the supposed resemblance of its principal mountain to the famous one so called near Barcelona, in Spain. Plymouth is the chief town. It is situated on the south-west side. The shipping lies in an open roadstead. There is indeed no harbour or bay on any part of the shore, and it is hazardous for ships to remain at the island during the hurricane months.

**MOOLTAN.** See **MULTAN.**

**MOON.** The moon is the nearest of all the heavenly bodies to the earth. Except perhaps a comet, no other body can ever come within one-hundredth part of her distance. The actual distance of the moon varies. It may possibly be as little as 221,000 miles, and may even amount to as much as 259,600 miles. The average distance is 240,300 miles, and the fluctuations are generally confined to about 13,000 miles on each side of the distance. The diameter of the moon is 2160 miles, or a little less than two-sevenths of the diameter of the earth. The volume of the moon is about one-forty-ninth



that of the earth, and the relative sizes of the moon and the earth are shown in the annexed figure. The actual mass of the moon is less than might have been anticipated; it amounts to 1—81.44 that of the earth. The materials of the moon are thus, on an average, but little more than half as dense as the materials of which the earth is made. The orbit in which the moon revolves is inclined at an average angle of 5° 9' to the ecliptic. The position of the node is changing; it moves round the ecliptic in the opposite direction to the motion of the moon, so that a complete revolution is accomplished in 6798.279 days, or a little more than eighteen years. The time of the moon's revolution around the earth, or what is usually called the mean sidereal revolution, is 27.321661 days. The most remarkable feature in the moon's motion is the identity between the period of the moon's rotation on its own axis and its revolution around the earth. As a consequence of this identity the moon always turns the same face to the earth, and astronomers have thus never seen the other side.

We shall first give a brief account of the very important theoretical researches which have been made as to the moon's motion, and then we shall conclude with a brief

sketch of the physical features of our satellite. As explained in GRAVITATION the orbit of the moon, due to the attraction of the earth, is an ellipse with the earth situated in the focus of that ellipse. If all sources of disturbance were absent, the shape of that ellipse would not change and its plane would be unalterable. The movements of the moon are, however, not by any means of so simple a character. The shape of the moon's orbit is not exactly an ellipse, nor does the plane of the orbit remain constant, and therefore there are disturbing influences at work. No doubt it is by the gravitation of the moon towards the earth that the motion of the moon is mainly controlled. The disturbing body in this case is the sun. The earth and the moon are of course both attracted by the sun, but the moon during one-half of its revolution is more powerfully attracted than the earth, and during the other half less. This irregularity is the chief cause of the lunar perturbations.

At new moon, the moon being then between the sun and the earth, the sun's attraction on the moon exceeds its average value; the moon is therefore somewhat drawn in towards the sun, or the distance from the earth to the moon is increased. At full moon the earth is more powerfully drawn than the moon, and thus again the distance between the earth and the moon is increased. At the quarters, the earth and the moon being sensibly at equal distances from the sun, there is no influence on their distance from each other; but as the disturbances, when they exist at all, tend to increase the distance, it follows that on the whole the moon's orbit (supposed circular) is larger than it would be were that disturbance absent. This enlargement of the moon's orbit must be greater as the disturbing influences become more efficient. The efficiency of the disturbance depends upon the proximity of the sun; therefore, when the sun is near the earth at perihelion, the moon's orbit must be more enlarged than when the sun is further from the earth at aphelion. Directing our attention exclusively to this particular disturbance, it appears that the radius of the moon's orbit is at a minimum in June and July, and that it gradually increases to a maximum in December and January. As the moon's orbit grows the time of revolution increases; this means that the moon will require more time to accomplish a given angular distance, and consequently at the latter end and beginning of the year the moon will fall behind its mean place, while in the middle of the year it will be in advance of its mean place. Such is the origin of the *annual equation* discovered by Tycho Brahe by observation long before the explanation of it was known.

Were the eccentricity of the earth's orbit constant, then the motion of the moon, so far as the annual equation was concerned, would complete its cycle of changes in a year, and be exactly the same at the end as it was at the beginning. As the axis major of the earth's orbit remains constant, it can be shown that the sun must cause the orbit of the moon to decrease if the eccentricity of the earth's orbit decreases. At present the eccentricity of the earth's orbit is decreasing from one century to another, and consequently there is a gradual decrease in the moon's periodic time; the moon is thus continually in advance of its mean place, so producing the phenomenon known as the secular acceleration. The gradual diminution of the eccentricity of the earth's orbit will not continue indefinitely. All the secular inequalities of the planet's orbits are really periodic, though usually requiring vast durations of time to run through their changes. The time will, however, come when the diminution of the eccentricity of the earth's orbit will be turned into an increase. The acceleration of the moon now in progress will then, so far as it is due to this cause, be turned into a retardation. This again, after the lapse of ages, will be turned into an acceleration, and so on indefinitely.

Even the secular acceleration of the moon's motion is thus really a periodical phenomenon when we deal with sufficiently great periods of time; but when we push our inquiries still further, we discover that the moon must also be undergoing movement not of a periodic character. The movement here referred to is hardly one that can be established by observation. Its effects have been too slow to render the lapse of even centuries adequate to produce a really measurable change. The phenomena now to engage our attention have been deduced purely from dynamical considerations, but they present results of the highest importance, as has recently been shown, principally by the labours of G. H. Darwin. It follows, from a well-known theorem in dynamics, that the angular velocity of the rotation of the earth and the angular velocity of the revolution of the moon around the earth are so connected that if either increases so must the other increase, or if either decreases the other must also decrease, always provided that there be no external interference. The moon raises tides on the earth; those tides produce friction at the extreme of the velocity of the rotation of the earth, and thus rob the earth of some of its velocity of rotation. The angular velocity of the earth's rotation is therefore decreasing, slowly no doubt, but still inexorably and without ever a moment's arrest. It therefore follows that the moon's angular velocity must decrease. Dynamics will so have it; and this can only be accomplished by the moon's orbit becoming larger, that is, by the moon receding from the earth. Out therefore the moon must go, and out it will continue to go, until, in some dim and incredibly distant epoch, the day will have gradually increased until it is equal to the period of revolution of the moon. At that time the moon will have receded so far that the month will have become double as long as at present, and the velocity of the earth's rotation will be abated to a sixtieth part of its present amount. We can also apply the same reasoning to look back into the past. As the length of the day is now increasing, and will increase, so, looking into the remote past, we find the day getting less and less; far enough back we find a day only twenty-three hours long, instead of twenty-four, and back earlier still we see nothing to interfere with the retrospect, until at a critical epoch many millions of years ago the day was only a few hours, or a fraction of its present value. Equally remarkable have been the changes in the moon's orbit in past times. As the moon is still receding we must have found it closer in ancient days than now; the further we go back the nearer must the moon have been, until at the critical epoch, immeasurable ages ago, the moon must have been quite close to the earth, and spinning round the earth in a few hours.

It seems highly probable that the moon was once in a more or less fluid condition, and must then have been acted upon by great tides produced by the attraction of the earth. These tides have so affected the moon's rotation that whatever it may initially have been, they have constantly tended to bring the moon's rotation into identity with its revolution, so that the same face of the moon is constantly turned to the earth. We have thus a physical explanation of the circumstance that the same face of the moon is always turned to the earth.

At the present day the moon appears perfectly rigid. Its surface is diversified by the most rugged chains of mountains and by the wildest and most savage scenery, as shown in fig. 1 of the annexed Plate. But the chief feature in any lunar landscape is the presence of numerous objects which are usually called craters, and are generally believed to mark the sites where volcanoes raged in the days of the moon's activity. The typical crater is a circular depression, perhaps some or many tens of miles in diameter and a mile or more in depth. The floor of this crater is usually tolerably level, save at its centre, where a noble mountain often rises to the height of Vesuvius itself.

Precipitous walls surround the crater, forming sometimes nearly a complete circle, but often irregular or interfered with by other craters. Two of these craters are shown separately in figs. 2 and 3. The dark spots familiar on the face of the moon are plains of great extent, flat to a superficial view, but on closer examination often found to contain minute craters or isolated rocks and irregularities. The surface of the moon appears absolutely destitute of water. There are neither lakes nor rivers, seas nor ocean, there are not even clouds or mists—the moon seems a desert in the most intense sense of the word. Nor is there any appreciable atmosphere; we cannot perhaps say that air is altogether wanting. It need hardly be added that life as we know it could not exist for a moment on the moon.

*Eclipses of the sun* are caused by the interposition of the moon between the sun and the earth. They are called *total* when the apparent diameter of the moon is sufficient entirely to hide the sun's disc from the observer, as shown in fig. 4. The eclipse is said to be *annular* when a portion of the sun's disc, in the form of a ring, is left uncovered, as in fig. 5.

*Eclipses of the moon* are due to its passing into the shadow cast by the earth, as shown in fig. 6. This may be either partial or total, according as the moon is more or less deeply immersed in the earth's shadow. Its appearance during a partial eclipse is shown in fig. 7, the portion covered by the shadow being faintly illuminated by light refracted by the earth's atmosphere. It appears of a ruddy colour, for the same reason that the sun's light does so at sunset.

**MOON-EYE.** See HYDROD.

**MOONWORT** is a plant nearly allied to ADDER'S-TONGUE, both belonging to the class OPHIOGLOSSACEÆ. They were at one time classed with FERNS. The frond of Moonwort (*Botrychium Lunaria*) is pinnate; there are from three to eight pairs of divisions (*pinnæ*), which are moon or crescent shaped. A branch springs from the stalk of the frond, which bears spore-cases on smaller divisions at its apex. The spore-cases burst vertically in two equal hemispherical valves. There are about twelve species of *Botrychium*, found in various parts of the world, except Africa. but the moonwort is the only British species. The old herbalists considered that it possessed medicinal virtues.

**MOOR**, a name given to extensive wastes which are covered with heath, and the soil of which consists of poor light earth, mixed generally with a considerable portion of peat. The want of fertility in moors arises chiefly from a deficiency or superabundance of moisture, the subsoil being either too porous to retain it, or too impervious to allow it to escape. Both extremes occur in some moors, which are parched up in dry weather, and converted into a dark mud by any continuance of rain. A considerable portion of iron in a state of hydrate is also generally found in the soil of moors, which is very hurtful to the vegetation of plants, except heath, furze, and those other coarse plants, which almost entirely cover the moors. This iron is carried down through the light surface soil, and if it meets with a less porous earth below, is frequently deposited in a thin layer, cementing the particles of silicious sand which are carried down with it, and forming what is called the *heath-pan* or *moor-band*. This substance is perfectly impervious to water, and wherever it exists in a continuous state all attempts at improvement are vain till it is broken through or removed. The roots of trees occasionally find a passage through interstices or fractures of the pan, and then often grow luxuriantly. But wherever young trees are planted without the precaution of breaking through the moor-band, they invariably fail. When the moor consists of a loose peaty earth of little depth incumbent on a rock, as is the case in many mountainous countries, no art can fertilize it.

In several cases, however, extensive moors have been con-

verted into flourishing farms of arable and grass land, as in many parts of Scotland and the north of England; sometimes they have been most advantageously planted with forest trees, and where there is a great extent of waste and a scanty population, this is generally the most certain mode of improving a property, although the return is slow and distant.

**MOOR-CKOCK** and **MOOR-FOWL** are the common names for the Red Grouse (*Lapopus scoticus*). See GROUSE.

**MOORE, GENERAL SIR JOHN**, son of the author of "Zeluco," was born at Glasgow in 1761, and received his first commission in the army at the age of fifteen years. It was in the descent of the British troops upon Corsica, in 1794, in concert with Paoli, that he first distinguished himself, while in the West Indies in 1796, in Ireland during the rebellion of 1798, and in the expedition to Holland in the following year, he established for himself the reputation of an officer of the highest promise. In the expedition to Egypt in 1801 he commanded the reserve of the army, and highly distinguished himself at its head. For his services in this campaign he was created a knight of the Bath.

On the recommencement of hostilities, after the short peace of 1802, Moore superintended a camp of instruction on the Kentish coast. After being for some time employed in the occupation of Sicily, and in an expedition to Sweden to assist Gustavus Adolphus IV., he was selected to command the army in the Spanish Peninsula. He landed in Portugal in August, 1808, too late to share in the battle of Vimiera; but his force being intended to co-operate with the Spanish in the north of the Peninsula against the French invaders, he began the march from Lisbon in October, 1808. He had scarcely entered Spain before the defeat and destruction of the Spanish armies at all points on their northern line utterly extinguished the prospect of a successful campaign, false intelligence deceived him, and he suddenly ascertained that the whole of the disposable French armies in the Peninsula were gathering to surround him. Rejecting all hope of the defence of Portugal, he commenced a rapid retreat to Coruña, the sufferings and disorders of which, conducted as it was in the depth of a severe winter, and through the mountainous region of Galicia, will long be remembered in our military annals. His disasters were closed, on 16th January, 1809, by the battle of Coruña, in which the troops, though previously to all appearance exhausted and disorganized, were inspired by the exertion of their gallant leader and their own native valour, to inflict a decisive repulse upon their pursuers. Their triumph was dearly purchased by the death of their commander, who, in the heat of the action, was mortally wounded by a cannon ball and expired a few hours afterwards, but not until he had learned the total defeat of the enemy. The beautiful little poem on "The Burial of Sir John Moore," which is so deservedly a favourite with all classes of readers, was the composition of an almost unknown clergyman, the Rev. Charles Wolfe, a native of Dublin (1791–1823), curate of Ballyclog, Tyrone, and was published in 1817 in an Irish newspaper. It at once attracted great attention, and was attributed by the poet laureate Southey to the famous Thomas Campbell, until the latter denied having written it. The true author was not known till after his death.

**MOORE, THOMAS**, the national poet of Ireland, was born on the 28th of May, 1779, in Dublin. His father pursued the trade of a vintner, and was a respectable honest citizen, but nothing more. The son derived his genius apparently from his mother, who was a woman of superior capacity, and discerning the indications which he gave of future excellence, exerted herself to procure for him a suitable education. Both his parents were Roman Catholics; and as at that time the penal laws which inflicted severe disabilities on members of that communion were in full

force, the sphere for the display of the youthful Moore's precocious talent was limited. From an early age he displayed a strong taste for music and poetry, and, like Pope, he lisped in numbers; at fourteen he contributed poetry to a Dublin magazine, and it required all his mother's influence to retain his vagrant fancies within a proper limit.

When fifteen years old he entered Trinity College, Dublin, with the object of preparing himself for the legal profession. He studied with considerable diligence, but he did not forget to cultivate the Muse, and like most young impetuous minds, he plunged into the rapturous excitement of politics. The friend and disciple of Robert Emmet, he incurred the suspicion of the authorities as a possible conspirator against "law and order," and narrowly escaped expulsion in 1798. Having taken his degree, however, he removed to London, and began to read for the bar. His pecuniary means were slender; but he had obtained an introduction to Lord Moira, and that amiable nobleman, charmed by his wit and vivacity, procured him admission into the higher circles of fashion, where for many years he was a welcome and a favoured guest—too welcome, indeed, for his own health and fortune.

While at college Moore had begun a translation of "Anacreon," which he now published, in 1801, with a brilliant list of subscribers, and dedicated to the Prince of Wales. The elegance of its versification immediately attracted attention. The translator became a "lion," and encouraged by his success published a collection of original poems, under the playful title of "Works of the late Thomas Little."

In 1803, through the influence of Lord Moira, he was appointed registrar at the admiralty court of Bermuda, and proceeded thither to perform the duties of the post. He soon wearied of colonial life, and leaving his work to be performed by deputy, he returned to England in 1804. In the following year appeared his "Odes and Epistles," which elicited a severe criticism from the *Edinburgh Review*. A duel took place between him and the editor of the *Review*, Lord Jeffrey, immortalized by Lord Byron in the "English Bards and Scotch Reviewers"—

"Can none remember that eventful day,  
That ever-glorious, almost fatal fray,  
When Little's headless pistol met his eye,  
And Bow Street myrmidons stood laughing by?"

The duel was prevented by the interference of the magistrates, and, on examination, the pistols were found to be unloaded! Moore and Jeffrey afterwards became close friends, and an angry correspondence between Moore and Byron proved a prelude to a long and affectionate intimacy.

The poet now produced his "Irish Melodies," the work on which his fame will principally rest. These amatory, bacchanal, and patriotic songs are characterized by singular wealth of fancy and richness of diction. Never were strains more musical; never did poet express his sentiments in more melodious phraseology. The flight is not very bold, but it is well sustained. Occasionally, it is true, the modern bard attempts to strike the lyre of a Tyrtæus, but in such cases his hearers are moved to admiration by the perfection of his art, rather than stirred to enthusiasm by the inspiration of his genius. We feel that there is something wanting, and while we acknowledge the ability of the singer, we mistrust the genuineness of the song. He is much too intent, we reason, upon striking out a subtle analogy or elaborating an ingenious stroke of fancy, to be really in earnest. It is safe to predict that except the "Irish Melodies" scarcely anything of Moore's will survive.

In 1811 Moore was married to Miss Elizabeth Dyke the beautiful and affectionate "Beasy" of his Diary, and a woman of high personal character and great mental attainments, who commanded the respect and admiration of all who knew her. Having lived too fast for his means Moore was obliged to retire in 1812 to the seclusion of a charming

little cottage near Ashbourne, in Derbyshire. There he wrote the "Twopenny Post-Bag, by Thomas Browne the Younger," a series of satires against the Prince Regent and his ministers, which produced an immense effect. His poetical reputation was now so great that Longman & Co. engaged him to write "Lalla Rookh," which appeared in 1817, and for which they paid him the then unheard-of sum of £8000.

But Moore's exultation in his success was soon clouded by the disastrous losses to which he was exposed through defalcations on the part of his Bermuda deputy, by which he found himself involved in liabilities to the amount of £6000. His friends and patrons generously came forward with offers of assistance, but the poet, with manly independence, refused them all, and resolved to discharge the claim by the exercise of his own talents and industry.

He now paid a visit to the Continent, and resided for some time at Venice with Lord Byron. Returning from his continental tour he settled down at Sloperston, close to the residence (Bowood) of his generous and steady patron, the Marquis of Lansdowne. Here he produced, in 1823, his "Loves of the Angels," a poem overloaded with prettinesses, and his "Life of Sheridan." Between 1824 and 1827 he wrote the novels "The Epicurean" and the "Memoirs of Captain Rock." In 1830 he published his interesting but gravely incomplete biography of Lord Byron, having earned the bitter reproaches of posterity by destroying Byron's MS. Memoirs, which had been intrusted to him. Moore received £4870 for the "Life of Byron."

The later works of the poet evince a marked falling off in his powers. They were—a "Life of Lord Edward Fitzgerald, the Irish Patriot" (1831); "Travels of an Irish Gentleman in Search of a Religion;" and a "History of Ireland," for Lardner's *Cabinet Cyclopædia*. In 1835 Lord Melbourne bestowed upon Moore a pension of £300 a year. He died on the 28th of February, 1852, in his seventy-third year, his mind having quite given way some time before.

A collected centenary edition of Moore's works has been published by Mackenzie, with numerous illustrations, and the airs of the Irish melodies and other important lyric pieces. "Moore's Life and Letters" were edited by the Right Honourable Earl Russell.

**MOOR-HEN or WATER-HEN** (*Gallinula chloropus*) is a common British water-bird, belonging to the Rail family (Rallidæ) of the order GRALLÆ. The moor-hen is about the size of a small bantam-hen, and resembles very nearly the coot in appearance and habits; but while the latter bird has a large ivory-white shield on its forehead, the frontlet of the moor-hen is small and of a bright scarlet colour. The plumage of the upper surface is a very deep olive-brown, appearing black at a distance; the under surface is a dull gray, and the lower tail-coverts are pure white. The gallinule, moor-hen, or water-hen is generally distributed over the Old World, always inhabiting marshy places. The moor-hen swims and dives with great facility, and is rarely seen except on the water, along which it moves with a nodding motion of the head, probably corresponding to the strokes given by the feet. It picks up most of its food while thus swimming about, and obtains some also by diving to the bottom of the water; but in the morning and evening not unfrequently wanders to the damp meadows in its vicinity in search of worms, insects, and slugs. Occasionally this bird perches on the branch of a tree, and it has even been known to place its nest upon a branch hanging close to the surface of the water; but the nest is generally made on the ground among reeds and other herbage. The eggs are from seven or eight to eleven in number, and the birds produce two or three broods in the season. In winter the moor-hens frequent running water which is not liable to be frozen over, and in severe winters they take to hedgerows and plantations, and

appear to feed on berries and seeds. Other species of the genus *Gallinula* are found nearly all over the world. One species, *Gallinula nesiotis*, which inhabits Tristan da Cunha, has wholly lost the power of flight.

**MOORISH ARCHITECTURE**, otherwise the *Moresque* or *Arabian style*, is that variety of Saracenic or Mohammedan architecture practised by the Arabs or Moors of Spain, and of which many exquisite remains in that country, at Cordova, Granada, &c., still attest both their skill and taste. One of its most striking and peculiar features is the stilted *horse-shoe arch*, or, as it might with more propriety be termed, the *crecscant arch*, because it resembles that symbol of Mohammedan faith.

On the accompanying Plate is an example of the crescent or horse-shoe form, the centre being raised above the chord of the arch, and the curve being consequently greater than a semicircle: the figure shows the arch supported on columns. This example is taken from the entrance to the sanctuary of the Koran at Cordova. The cusped or scalloped arch is also very general; the outline is produced by intersecting semicircles.

Soil-headed partments in Gothic windows; but beyond that general resemblance, the character is altogether different. In the Plate will also be found an example of the slender pillars peculiar to Arabian architecture, and another variety of Moorish arches from the Court of the Lions in the Alhambra, which has been beautifully reproduced in the Crystal Palace, Sydenham, near London.

It is probable that this very persistent element of slenderness in regard to pillars indicates the tent-origin of the style, a character which was further kept up by concave ceilings and encolas, emblazoned with painting and gilding. The whole surface was frequently brodered over with decoration, which consisted almost entirely of ornamental patterns composed either of foliage or geometrical figures, though occasionally with an intermixture of both. The decorations of the former class have given rise to the modern term *Arabesques*. One very prevalent and very peculiar element of Arabian decoration is the use of inscriptions, evidently with reference to their ornamental effect. So far there is a very striking analogy between the practice of the Moslems and that of the ancient Egyptians.

Lattice or open trellis-work was another fertile source of embellishment, and was very much akin to the perforated tracery frequently met with in Gothic buildings. Of perforated battlements and parapets this style furnishes some exceedingly rich and tasteful specimens, although not among the remains of Moorish architecture in Spain. Excellent illustrations of this rich and peculiar style under Christian modifications will be found in the ancient church of Gelnhausen, and it was also employed in the monkish cloisters of Aschaffenburg, as shown in the Plate.

Great fancy and diversity of invention are shown in the devices of mosaics and pavements, many of which appear exceedingly elaborate, although, when analyzed, they are found to be very simple in principle. Among the other ornaments which mark this style, the honeycomb fretwork and stalactite-like drops, or pendants, of ceilings and roofs, deserve to be mentioned; also the small star-shaped apertures cut in a sloping direction through the domes or vaults over baths, for the purpose of admitting only a subdued degree of light. These features are nowhere seen in greater perfection than in the Alhambra at Granada. Domes and minarets are features almost confined to mosques and other religious edifices.

There is little doubt that Gothic architecture is indebted to the Moors for the pointed arch and the various forms of the trefoil and the quatrefoil arches, though we are accustomed to associate them entirely with Christian edifices. Parker asserts that the pointed arch is found in Mohammedan buildings so early as 780, while it was not introduced into Christian architecture until the twelfth century.

**MOORS**, properly the name of an African people, akin to the Numidians, who inhabited Mauritania, but now held to include all the Mohammedan nations who subdued Spain at the beginning of the eighth century, and retained their hold upon it until the latter end of the fifteenth.

Thirty-five years after the death of the Prophet, the Arabs, after conquering the fertile regions of Asia, poured into the vast continent of Africa, and having firmly established themselves upon its northern coast, they crossed the Mediterranean and invaded Spain. In 710 A.D. the Mohammedan general Tárik, a freedman of Musa ibn Nusseyr, the Arabian viceroy of Africa, landed with 12,000 men at the foot of the rock Calpé, which received afterwards his name Jehel-Tárik, subsequently corrupted into Gibraltar, and two months afterwards the memorable battle was fought on the banks of the Guadalete which overthrew the Gothic Empire of Spain. Tárik promptly followed up his victory, and Cejira, Malaga, Elvira, Cordova, and Toledo were either speedily reduced or opened their gates to the conquerors. Musa, jealous of the success of his lieutenant,

d over also into Spain at the head of 18,000 men, and in less than three years all Spain was subdued, to the very foot of the Pyrenees. In 732 the Arabs endeavoured to extend their dominion, and invaded Gaul in a larger Mohammedan army than had yet trodden the plains of the Continent, but after penetrating as far as Tours, they were completely defeated by the Franks under Charles Martel. They retained, however, their hold upon Spain, and about the middle of the eighth century Abd-el-Rahman asserted his independence of the Eastern Caliph, and set up a separate western kingdom, which was ruled by the dynasty he founded until 1031. The most distinguished member of this house was Abd-el-Rahman III., who succeeded to the throne in 912, and who may safely be pronounced the greatest monarch that the Spanish Arabs ever had. In his wars against the Christians he was very successful, and he increased his dominions by the addition of a large portion of Mauritania and the city of Fez its capital, which he wrested from the hands of the Idrisites. Elated with so much success, he shook off the yoke which, in religious matters at least, still bound Spain to the East, and assumed the titles of Amir-el-Mumenin (Commander of the Faithful), Caliph, and Imám. His Commission to the great mosque of Cordova, the foundation of the town and palace of Azzahra, the endowment of several colleges and schools, the formation of an extensive library within his palace, the construction of roads, canals, and aqueducts, all attest his taste for luxury, his love of the arts, and his unceasing activity. After a prosperous reign of upwards of fifty years he died in 961. The strength of the Caliphate of the West was maintained until the death of the warrior Al-Mansur in 1008, but after that event it declined rapidly through internal discord, and it came to an end in 1031 and was succeeded by a number of independent kingdoms. A period of turmoil and civil war followed, which lasted until the end of the eleventh century, when most of the smaller states had become blended into one or another of the great kingdoms, and Mohammedan Spain was divided into the provinces under Mohammed ibn Abdúl, king of Seville, Zúhry, king of Toledo, Al-Mostain, king of Saragossa, and Omar Al-Motawakel, king of Badajoz and part of Portugal. The divisions among the Moors, however, had materially weakened their power, and a considerable portion of Portugal and much of New Castile were wrested from them by the Christians. At this period the Mohammedans of North Africa had been formed into a powerful confederacy by their leader Yúsef for assistance against the Christians. Yúsef acceded to their request, crossed the strait at the head of a powerful army in August, 1086, and in October gained a signal victory over Alfonso VI., king of Castile and Leon, at a place called Zalaca, near Badajoz.

This victory being followed up with other successes, checked the progress of the Christian monarch; but Yúsef, struck by the fertility of the Peninsula, turned his arms against the people he had come to protect, and succeeded in establishing his own supremacy. The ascendancy of the Almoravides was maintained until 1143, when, owing to the attacks of the Almohades upon Mauritania, they were compelled to leave Spain to its own resources. Soon afterwards the whole of North Africa was subdued by the Almohades, and before the close of the twelfth century they had added Mohammedan Spain to their dominions, and had reconquered some of the ground that the latter had lost to the Christians. In 1211 Mohammed ibn Abdallah crossed the strait at the head of perhaps the largest army that Africa ever poured on the shores of Spain, but he was defeated at Las Navas, and this defeat may be considered as one which involved the ruin of the Mohammedan Empire in Spain. The contest which followed was prolonged and obstinate, and it was not brought to an end for nearly two centuries, but during the whole of this period it was evident that the Crescent was declining before the Cross. In June, 1236, Cordova surrendered to the Christians; Valencia capitulated in September, 1238; Denia in May, 1244; in 1246 all the fortresses on both banks of the Guadalquivir, from Jaen to the gates of Seville, fell into their hands; and in 1248 the city of Seville was captured by Ferdinand III. After these victories the Moorish king consented to become the vassal of Ferdinand, and though towards the close of the century an attempt was made by the Moors to re-establish the supremacy of Islam, it was entirely unsuccessful. Passing over a succession of unfortunate sovereigns, several of whom were the victims of civil war or of assassination, we come to Mohammed X., who reigned for twenty-one years in comparative tranquillity. Then in 1460 Gibraltar and Archidona with all the intermediate country fell into Christian hands, and the Moorish king only obtained peace on condition that he should hold his kingdom as a fief of Castile. In 1479 Aragon and Castile, the two most powerful monarchies of the peninsula, were incorporated, and by this union the doom of the Moorish kingdom of Granada was sealed. In the spring of 1491 Ferdinand invested the capital, and after a siege of nearly a year the standard of the Cross waved on the Vermilion Towers of the Alhambra. The subsequent fate of the conquered Mohammedans is noticed under MORISCOES.

**Government, Institutions, &c.**—The government and institutions of the Spanish Arabs may be said, with very few exceptions, to have been modelled upon the Eastern caliphate. But although the principles of government were the same as in the East, and the vices of Mohammedan constitutions as prominent, yet the position of the Spanish Arabs contributed to give to their institutions a vigour and solidity which they never possessed in the East. Agriculture and trade were fostered by means of wise and paternal regulations, the population increased at an astonishing rate, and the revenue was computed at £5,000,000 sterling. Europe also is indebted to her Mohammedan invaders for the first lessons of science and learning. The first Moorish conquerors of Spain were a rude and illiterate people. It was not till the time of Abd-el-Rahman, the first of the Beni Umeiyah (A.D. 139, A.H. 756), that any attention was paid to the cultivation of letters. That monarch and his successors founded colleges, formed public libraries, encouraged literary pursuits by their example and their liberality, and by their successive efforts the study of the sciences was introduced into their states, and continued to flourish to a later period in Spain than in the East. Poetry has always been the favourite pursuit of Eastern nations; by the Arabs it was cultivated with an ardour which amounted to a passion, and the taste was rather increased than abated in Spain. The historians of Mohammedan Spain are numerous, but their merits are generally

not great. The most ancient is Abú Beker Al-Rázi, who flourished towards the end of the ninth century. It was in the physical and experimental sciences that the Spanish Moslems most excelled. From the establishment of the Umeiyah dynasty, the greatest attention was paid to the study of mathematics and all the other exact sciences. Copies of the works of Dioscoridès, Hippokratès, Galen, Aristotle, Apollonios, and other Greek writers, were procured in Constantinople, brought to Cordova, and translated. A Spanish Arab, a native of Toledo, named Az-Zarkal, improved the astrolabe, and invented an instrument for observing the motions of the heavenly bodies, which was long known in Europe by his name. The mechanical arts and manufactures were likewise carried to considerable perfection. The use of writing-paper was introduced into Europe; gunpowder was also improved and first used by them in war; and there is every reason to suppose that to them belongs the honour of the discovery of the mariner's compass.

**MOORSHEDABAD.** See MURSHIDABAD.

**MOOR'UK.** See CASSOWARY.

**MOOSE.** See ELK.

**MOOT.** See MOTTE.

**MOP'LAHS**, the name given to a tribe of Mohammedans which forms about a fourth part of the population of the Malabar or West Coast of South India. They are believed to be the descendants of Moors and Arabians who settled on the coast, and intermarried with native women, their numbers being recruited by converts from Hinduism. They number about 600,000, and though, as a rule, they are hardworking cultivators and keen traders, they are liable at times to serious outbreaks of religious fanaticism.

**MORA TREE** of Guiana is a gigantic timber tree, imported into this country for shipbuilding. It is one of the few timber trees placed on Lloyd's list of shipbuilding woods. Robert Schomburgk was the first to send specimens of the flowers and leaves for botanical description. He thus speaks of this important tree:—"Prominent among the trees which adorn the forests of Guiana, and which astonish by their profuse verdure and gigantic size, stands the majestic mora, the king of the forest. Rising to a height of from 60 to 90 feet before it gives out its branches, it towers over the wall-like vegetation which skirts the banks of the rivers of Guiana, forming a crown of the most splendid foliage, overshadowing numerous minor trees and bushes, and hung with lianas in the form of natural festoons. The trunk, rugged and clothed with epiphytes, juts towards the base into tabular buttresses or excrescences (resembling in that property the silk-cotton tree, *Bombax Ceiba*). These buttresses are subjected to an early decay, and they sometimes form a cavern, which would afford room and protection against the inclemency of the weather to several persons." The timber is very close-grained, tough, and not liable to split. The full-grown tree will furnish logs from 30 to 50 feet long and from 12 to 24 inches square. Schomburgk gives the measurements of one of these trees:—Height from the ground to the first branches, 63 feet; total height, 93 feet; circumference of the tabular excrescences, 71 feet; their largest diameter, 38 feet; height of the buttresses from the ground to where the trunk takes on a more regular form, 20 feet, the circumference of the trunk there being 21 feet. The tree has a very pleasing appearance, the dark green of its leaves contrasting well with its snow-white blossoms, which grow in dense spikes, clustered at the ends of the branches. Benthani, who first botanically described this tree, named it *Mora excelsa*. It belongs to the order LEGUMINOSÆ. The calyx is bell-shaped; the petals, five or six, equal; stamens, ten or twelve, each alternate one being sterile; the pod is hard and woody, containing one seed.

**MORaine PROFONDE** is the name applied by Swiss geologists to the mass of gravel, sand, and clay that



lies beneath a glacier or vast ice sheet, and which is moved along with it.

**MORAINES** are the accumulations of rock, debris, clay, sand, gravel, and stone that lie on the surface of glaciers. They are formed by the disintegration effected by frost, &c., on the exposed sides of the adjoining mountains. Loosened fragments of rock breaking off and rolling down the slopes, finally rest on the edge of a glacier; these, as the ice is incessantly moving outward, form a continuous line of blocks and other debris along the margin of the glacier. Such an accumulation is called a *lateral moraine*. Where two glaciers unite, the adjacent lateral moraines coalesce and form a moraine down the central portion of the glacier. This is a *medial moraine*. In large glaciers that have traversed a long distance, there are generally several medial moraines formed by the tributaries it has received along its course. The moraines usually rest on elevated ridges of ice; these ridges are produced by the adjoining ice melting away, that beneath the moraines having been protected from the heat of the sun. Where the glacier terminates, the debris that has been carried along by it is deposited; a large accumulation of heterogeneous stuff, extending across the valley at the face of the glacier, is therefore the result. This is called the *terminal moraine*; it is stationary, except when the glacier increases in size, and advances down the valley; then the terminal moraine is pushed forward, but on the recession of the glacier it remains behind. Many of these old terminal moraines are still recognizable in the glaciated mountainous districts of the British Isles; they are mostly of a limited size, but in continental districts, as on the plains of Lombardy and in Colorado, they reach huge dimensions. See **GLACIERS**.

**MORAL INABILITY** is the middle state between sanity, where motives produce appropriate actions, and insanity, where motives fail to operate. The typical case is the drunkard, who can act reasonably on all points save one, and who, though he gives way to his craving, is fully aware that in pawing his wife's bed, or selling the last loaf for a mouthful of alcoholic poison, he is committing a crime. Children are often morally unable to resist the temptation of sweets. The craving overmasters all sense of duty and prudence, but not to the point of blotting them out. The act once done, the sinner often feels genuine remorse. Thus the habitual inebriate will sometimes voluntarily place himself under restraint, and submit to much inconvenience in an attempt to regain his moral balance. Moral inability requires not only a terrible craving, but also a weakened state of the intelligence for its appearance; because when the memory is vigorous, and assists the imagination vividly to predict the consequences of the proposed crime, it grows so horrible that the criminal revolts, though with pain at his unsatisfied craving, and is saved. Moral inability in the young is therefore lightly looked upon, because as the mind develops and strengthens by experience it may pass away. Not so with the irreclaimable drunkard, the thief, or the debauchee, whose state is indeed a miserable one, worse than that of the totally insane.

**MORAL SENSE** is a name which, occurring first in Lord Shaftesbury's "Inquiry concerning Virtue," and afterwards adopted by Hutcheson, has since come to be very generally employed to denote the feelings with which we regard men's actions and dispositions. These feelings are known also by the name of feelings of moral approbation and disapprobation. There is no dispute about the fact that men have moral judgments, but the dispute is as to the origin of them. It is generally supposed that they must be either a part of man's nature, like his other faculties, or that they must be derived from the exercise of his faculties. Those who consider that there is a natural faculty by which we discern between right and wrong, sometimes call it a Moral Sense, by way of analogy. Others think that the morality or immorality of actions depends

on the influence of those actions, and of the dispositions in which they originate, upon the happiness of mankind; and that we form this judgment of the consequences of actions, that is, of their morality or immorality, as we do of anything else, by the exercise of our understanding and of our senses: this is the theory of utility. Those who will judge of things by the constitution of our nature and of the things around us, will not accept either theory to the total exclusion of the other. See the articles **CONSCIENCE** and **ETHICS**.

**MORALES, LUIS DE** (*El divino*), one of the few Spanish painters of the highest rank, as his sobriquet bears witness, was born in Badajoz in 1509, and died in 1586. Philip II. summoned him to Madrid in 1564, and employed him for some time. Towards the close of his life he fell into great poverty, and the king hearing of this gave him a yearly pension of 800 ducats. Genuine works by Morales are rarely seen out of Spain. Even the museum at Madrid has but five. The finest of his paintings are some large full-length figures at Higuera de la Serena, Estremadura. As a rule his paintings are small and simple, and somewhat stiff, but all display great genius. Had he lived in Italy instead of Spain the world would have been the richer by a grand painter.

**MORALITIES**. From very early times it became the custom to supplement the Roman Catholic mass, "in itself essentially dramatic," with scenic representations, by which it was sought to impress upon an unlettered laity the principal dogmas of the faith. The liturgical drama developed into the **MIRACLE** or **MYSTERY PLAYS**, of which the Moralities were a variant type. The special feature of the Moralities was their allegorical nature. They were made to serve political uses later on, under Henry VIII.; but at their rise under Henry VI. they were really used, as their name implies, for a sort of rude philosophical teaching. Prominent among the motley group of characters presented moved the Devil, leaping upon the stage dressed like a bear, shouting "Ho, ho!" and "Out-harrow!" A frequent comrade was the Vice. The Vice represented that element of evil which is inseparable from human nature. Viewed from one side he was eminently comic; and his pranks cast a gleam of merriment across the dulness of the scenes through which he hovered with the lightness of a harlequin. Like harlequin, he wore a vizor and carried a lathe sword. It was part of his business to belabour the Devil with this sword; but when the piece was over, after stirring the laughter of the people by his jests, and heaping mischief upon mischief in the heart of man, nothing was left for the Vice but to dance down to Hell upon the Devil's back. The names of the Vice are as various as the characters which he assumed and as the nature of the play required. At root he remains invariably the same—a flippant and persistent elf of evil, natural to man. Here are some of his titles, taken from the scenes in which he figures:—Iniquity, Hypocrisy, Infidelity, Hardy-dardy, Nichol New-fangle, Inclination, Ambidexter, Sin, Desire, Haphazard, Skelton's "Magnificence" and Lindsay's "Three Estates" are two of the best Moralities of the Tudor period.

About 1540 Nicholas Udall, by combining in "Roister Doister," a skillfully constructed fable with Heywood's character delineation, brought comedy to maturity from these rude beginnings of our drama. In the Matthew Merrigreek of this play, the author combined the popular qualities of the Vice with the conventional attributes of the classic "parasite," contriving at the same time to create a real personage, who would have been at home in ordinary English households. Tragedy did not arise for twenty years later, when Sackville (Lord Dorset), produced his "Gorboduc" (1561).

**MORALS**. See **ETHICS**.

**MORAT** (Ger. *Murten*), on the lake of the same name, in the canton of Fribourg, in Switzerland, is the site of the



second of the three great victories of the rebellions Eidgenossen, afterwards called Swiss, over their titular sovereign Charles the Bold, duke of Burgundy. Grannon and Morat were fought in the March and June of 1476 in Switzerland; and Nancy, when Charles fell, in 1477 in Burgundy.

"Morat and Marathon twin names shall stand."

—*Byron, "Childe Harold,"* III. 64.

In spite of the duke's great superiority of numbers, and the almost total lack of cavalry on the part of the Eidgenossen, the "rascal burghers" so chivalrously charged to the onslaught that the Burgundian lines were broken, and the duke himself would have been made a prisoner had he not saved himself by hard riding.

**MORAVIA**, a province of the Austrian Empire, bounded N. by Prussian Silesia, W. by Bohemia, E. by Hungary and Galizia, and S. by Austria. Its area is 8584 square miles, and the population in 1881 was 2,153,407.

*General Aspect.*—Moravia is shut in by the Carpathian Mountains on the E., by the Gesenke chain on the N., and by the Bohemian Mountains on the W.; it is open towards the S., in which direction the Morava takes its course towards the Danube. The interior is traversed by other chains, so that more than half of the country is mountainous. One of the most remarkable of these latter is the range extending from BRÜNN, the capital, to Olmütz. It contains numerous caverns and frightful chasms. The mountains inclose fertile valleys, and the central and southern parts of the province consist of extensive plains, the soil of which is extremely fruitful. The rivers are numerous; the largest is the March or Morava, which gives name to the country. This river, the navigation of which is difficult, rises in a cavern on the confines of Bohemia and Glatz, flows in a southern course through the middle of Moravia, receives most of the rivers, especially the Theya or Taya, and leaving the province at the southern point, from which it forms the boundary between Austria and Hungary, falls into the Danube above Pressburg. The Oder rises in the east of the province. There are numerous ponds abounding in fish. Moravia is subject to considerable variation of temperature; it enjoys a milder climate than some other countries in the same parallel.

*Animals and Products.*—The animals are horses (reared for export), oxen, sheep, swine, goats, red deer, feathered game, and poultry, especially geese, of which great numbers are exported. Bees are also reared in very large numbers. With respect to the productions of the soil, Moravia is one of the richest provinces of the empire. Agriculture is in an improved condition. Large quantities of very fine wheat, rye, barley, and oats are grown. Hops, flax, and hemp are very extensively cultivated; but the consumption of the two latter articles is so great that large quantities are imported. The vine flourishes. The forests furnish vast quantities of timber. The pastures are extensive, and cattle and sheep breeding, and cheese-making from sheep's milk, are largely carried on. Iron, coal, saltpetre, pipe-clay, marble, and precious stones, particularly topazes and garnets, are the chief mineral products.

*Industrial Resources and Population.*—The woollen, linen, cotton, and thread manufactures are on a large scale. The other principal branches of industry are—the making of cloth, flannel, and leather goods, silks, leather, paper, potash, glass, and beet-root sugar. Dyeing is carried on at Brünn, which is celebrated for dyeing Turkey red. The imports are colonial produce, wool, Vienna silks, Russian furs, tallow, wine, oil, porcelain, glass, &c.

Of the population about two-thirds are of Slavonic origin and the rest German, among them being many Jews. The inhabitants are chiefly Catholics. There is a university at Olmütz.

In the ninth century Moravia was the centre of a powerful

kingdom, comprising also Bohemia, Silesia, and parts of North Germany and Hungary. In 1806 it was the great theatre of war between the French and Austro-Russian armies; and suffered severely from the invasion of the Prussians in the Seven Days' War of 1866.

**MORAVIAN BRETHREN** or **UNITED BRETHREN**, a society of Christians whose history has been traced back to the religious movement in Bohemia instituted by John Huss. They cannot be identified either with the Calixtines or the Taborites, but appear rather to be descended from a party of devout men who were formed into a society by the Bohemian, Peter Chelacky, about 1457. In 1467 they held a synod at Iahotta, near Reichenau, and constituted themselves a separate church, and in the early portion of the sixteenth century they numbered about 150,000 members. The name by which they were known at this period was simply that of the United Brethren, and this they retained until the beginning of the seventeenth century. When the Reformation took place in Germany the Bohemian Brethren endeavoured to unite with the Lutherans, and when in 1522 they sent envoys to Luther, the reformer approved of most of their doctrines and discipline. The principles of Calvinism, however, proved to be more in harmony with their system than those of Lutheranism, and they flourished as an evangelical church until evangelicalism was crushed in Bohemia by the persecution instigated by the Jesuits in the early part of the seventeenth century. Among the persecuted was the famous COMENIUS (Komensky), the pioneer of all reasoned systems of education, who was exiled to Poland, 1630. Comenius was called to England in 1641 by the Long Parliament, and intrusted with the task of entirely remodelling English education. His labours were interrupted and for ever stayed by the Civil War, to the great loss of our country. In spite of the fiercest persecution some remained in Bohemia, however, and maintained in secret for a long time their peculiar beliefs. In 1722 a small company under Christian David, a mechanic, settled by invitation on the estate of Count Zinzendorf in Saxony, where they were speedily joined by others, and a small village, which received the name of Herrnhut or "Watch of the Lord," was built. It is from this circumstance that the brethren are commonly known in Germany as Herrnhuters. They had preserved the episcopate all through the period of persecution, and in 1735 David Nitschmann was consecrated first bishop of the renewed Moravian Church. Zinzendorf afterwards joined the fraternity and was recognized as its leader till his death in 1760. After his death their organization was completed by synods held in 1764 and 1769. The Moravians have always been a missionary church, and their work in this direction has been attended with a wonderful amount of success. As early as 1732 they sent two men to labour among the negroes of St. Thomas, and a mission to Greenland was begun in 1733.

At the present day the Brethren form a Unity, which is subdivided into the three great provinces of Germany, England, and America. Each province is to a large extent self-governed, but there is an intimate confederation on general matters. A general synod meets at Herrnhut at intervals of ten years, more or less, and is attended by the officials and bishops and delegates from the provinces and missions. To this body is intrusted the legislation on matters common to the whole Unity, such as the church's constitution, doctrine, discipline, and foreign missions. An executive, appointed by election, called the Unity's Elders' Conference, carries out the decisions of the synod, and exercises general superintendence during the intervals. The old organization of the society was remodelled in 1857, when the present constitution was devised.

In matters of doctrine the Moravian Brethren have no formal creed, but a simple confession of their faith was

drawn up in 1722, and another brief statement was issued in 1775. At their synod of 1879 they re-affirmed their acceptance of the Bible as their only rule of faith and practice, asserted their belief in the love of God the Father, in the real Godhead and real humanity of Jesus Christ, in the total depravity of human nature, in salvation through the sacrifice of Jesus Christ, in the influence of the Holy Spirit, in the necessity for good works, the fellowship of believers one with another in Christ, the second coming of Christ, and the resurrection of the dead unto life or condemnation. They have an episcopal organization, but the bishops make no claim to be governors, and their influence is distinctly and purely of a spiritual character. Their services are partly of a liturgical character, and where it is possible they meet for worship daily. Formerly they practised feet washing in the congregation before the communion, and cast lots in the election of ministers and in marriages, but these practices have fallen into disuse. In many places the Moravian Brethren are scattered among the general population, but they prefer, where it is possible, to live in separate colonies. In these little societies the married men and women live in houses of their own, but separate *choirs* or divisions, each under a pastor, are set apart for the children, youths, maidens, unmarried brethren, unmarried sisters, widowers, and widows. They practise a simple mode of living, but they do not aim at asceticism, and though they seek to blend all the affairs of life with religion, they strive to make the latter as bright and joyous as possible. The death of a member is made known to the rest of the community by a joyful melody from musical instruments, and the Easter service held in their cemeteries is accompanied with exultant song and music from brazen instruments. They have always bestowed great attention upon education, and owing to the impetus given by Comenius, and ever since carefully cherished, their schools are among the best in the world.

At the present day they have in the three provinces ten bishops, about 300 presbyters and deacons, and nearly 20,000 communicants, while they have nearly 80,000 communicants at their various missions. Their influence, however, has ever been immensely greater than their numbers would appear to warrant, and it must always be remembered that the great evangelical revival in England in the last century arose largely from the influence of the Moravians upon Wesley and others, while they were the first to call the slumbering Protestant churches to activity in the mission field.

See Gindely, "Geschichte der Böhmischen Brüder" (two vols., Prague, 1868), and "Moravian Missions," by A. C. Thompson, D.D. (London, 1883).

**MOR'AY** or **MUR'RAY FRITH** is a gulf of the German Ocean, on the coast of Scotland, bounded N.W. by the counties of Ross and Cromarty, and S.E. by those of Nairn and Elgin. The north-western shore of the frith extends nearly in a straight line from Kessock Ferry, opposite the town of Inverness, to Tarbet Ness, the north-western extremity of Ross-shire, a distance of 32 miles. The south-eastern shore extends from the town of Inverness to Fort George, and thence to Burchhead on the coast of Elgin.

**MORAYSHIRE.** See **ELGIN**.

**MORBIHAN**, a department in France, formed out of a portion of the ancient Lower Bretagne, is bounded N. by Côtes-du-Nord, E. and S.E. by Loire-Inférieure, S. and W. by the Bay of Biscay and the department of Finistère. A shallow inland sea (the *Conclusum mare* mentioned by Julius Cæsar in the account of his fierce campaign against the Veneti, "Bell. Gall." iii. 7-16), which communicates by a narrow channel with the Bay of Biscay, and extends far inland to the S. and W. of Vannes, inclosing several small islands, is called *Mor bihan*, from two Celtic words, signifying the "little sea;" hence the department takes its name. From N.W. to S.E. the department is 82 miles in

length; its mean breadth is about 41 miles. The area is 2625 square miles, and the population in 1886 was 535,256.

**Aspect, Soil, &c.**—The north of the department is covered by heath-clad hills, which slope down gradually towards the south into fertile plains. The coast presents a great number of bays, roadsteads, and harbours, the most important of which are those of Lorient, Port-Louis, Auray, Vannes, and Hennebont. The most remarkable headland is the peninsula of Quiberon, which extends southwards nearly 10 miles into the sea, and is connected with the mainland by an isthmus only 66 yards across, and so low that storm and spring tides sweep over it. The soil of the department is for the most part light, except near the coast, where it is strong, deep, and fertile. Very nearly half of the surface of the department is covered with heaths and moors. There are several islands along the coast, the chief of which are—**BELLE-ÎLE**, Groix, Houat, and Hoëdic, in the Bay of Biscay; and those of Aux-Moines and Arz in the Morbihan. Scarcely a commune in the department is without some Druidical stones or monuments. Half a mile from **CARNAC**, a large village near Auray, one of the most remarkable of these monuments is found.

**Rivers, &c.**—The department is traversed by ramifications of the mountains of Arree from north to south, and is drained by a great number of small rivers, some of which are navigable by means of the tide to a short distance from their mouths. The principal of them are—the Blavet, the Oust, the Vilaine, the Auray, and the Scorff. It is also traversed by the Nantes-Brest Canal, which runs along the course of the Oust, and then crosses into the valley of the Blavet at Pontivy; and by the canal which renders the Blavet navigable from Hennebont to Pontivy. The temperature is mild, but fogs are frequent; the prevalent wind is the south-west.

**Animals, Products, and Manufactures.**—Horses, cattle, and sheep are reared; lint, hemp, flax, turnips, and corn are grown; and a considerable quantity of cider and butter is made. Bees are numerous, and the honey of the department is highly prized. The wild animals comprise the wolf, fox, wild boar, deer, and goat. Water-fowl and fish are abundant. The sardine fishery along the coast is very profitable. A good deal of salt is made by evaporation at several points on the sea-shore. Iron, lead, and tin mines are worked; granite, building stone, slate, rock-crystal, potter's clay, &c., are quarried. There are no manufactures of importance, and there is a scarcity of wood fuel. The department is divided into the four arrondissements of Vannes, Pontivy, Lorient, and Ploërmel. The chief town is Vannes.

**MOR'CAR, EARL.** See **MORKER**.

**MOR'DANTS.** See **DYEING**.

**MORE, HANNAH**, a once popular authoress and a practical philanthropist, was born at Stapleton, near Bristol, in 1745, where her father had charge of the charity school. She and her sisters established a flourishing private school at Bristol. In 1773 Hannah published a pastoral drama entitled "The Search after Happiness," and the following year a five-act tragedy, "The Inflexible Captive." These gained her introductions to Dr. Johnson, Garrick, Burke, Reynolds, Goldsmith, &c., all of whom were charmed by her vivacity and wit. After writing a few other tragedies, now forgotten, she began her "Sacred Dramas" in 1782. Soon afterwards her character changed, her gaiety fled, and she retired from all but religious society, devoting herself to the composition of ethical books and tracts, some of which had an immense circulation. The latter period of her life was devoted chiefly to philanthropic work among the children in the benighted districts of the country. She died at Clifton, 7th September, 1833. Her collected writings were published in eleven vols. 8vo in 1853. Her "Memoirs and Correspondence," by W. Roberts, appeared in four vols. 8vo in 1834.

**MORE, HENRY**, was born at Grantlam in Lincolnshire, 12th October, 1614, and was educated at Eton and Christ's College, Cambridge, graduating B.A. in 1635, and M.A. in 1639. In 1640 he published his "Psychozoia, or the First Part of the Song of the Soul, containing a Christiano-Platonical Display of Life." He had been elected in the meantime a fellow of Christ's College. More's chief works, in addition to those which have been mentioned, are:—"Conjectura Cabalistica," "The Mystery of Iniquity," "A Key to the Revelation," "Enchiridion Ethicum," "Enchiridion Metaphysicum," "An Apology for Descartes," and "The Immortality of the Soul." He is one of the most eloquent and sagacious of the English Platonists, and his works abound in noble thoughts and fine images. More was one of the first fellows of the Royal Society. He died on 1st September, 1687.

**MORE, SIR THOMAS**, Lord Chancellor of England, and one of the most pleasing figures in English history, was born in London in 1480, and was the son of Sir John More, then a rising barrister, and afterwards a justice of the Court of King's Bench. He was educated at St. Antony's School, Threadneedle Street, and about his fifteenth year was placed in the house of Cardinal Morton, archbishop of Canterbury, who is said to have predicted his future greatness. In 1497 he went to Oxford, where he studied Greek under Linaere, a step which, as it was not required by the authorities, was regarded with disapproval by his father, who removed him from the university before he could take his degree. After he left Oxford he prosecuted the study of the law and soon acquired great celebrity for his legal knowledge. In 1602 he was appointed one of the under-sheriffs of London, and his reputation became so great towards the latter part of the reign of Henry VII., that it is said there was no case of consequence in which he was not engaged as counsel. In 1504 he attracted public attention by his opposition to a demand for money made by Henry VII. in Parliament—an offence which the king revenged by throwing More's father into the Tower and fining him £100. After the accession of Henry VIII., a successful pleading against the crown attracted the attention of the king, who, instead of being offended, took More into the service of the court. In 1514-15 he was employed on embassies to the Low Countries, was knighted and sworn a member of the Privy Council. In 1519 he was compelled to resign his post of under-sheriff to the city and his private practice at the bar in order to devote himself wholly to the public service, and in 1521 he was appointed treasurer of the exchequer. In 1523 he was elected Speaker of the House of Commons, and in the discharge of his duties he offended Wolsey, who made an unsuccessful attempt to get him out of the way by sending him as ambassador to Spain. In 1525 the king appointed him Chancellor of the Duchy of Lancaster, and during the next few years he showed More much favour, making him a personal favourite, and visiting him at his house in Chelsea in order to converse with him, and to enjoy his ever ready wit and his pregnant humour, his admirable scholarship and his keen criticism of the follies of the day. More, however, had formed a just estimate of the character of the king, and in answer to the congratulations of his son-in-law on one such occasion, he replied, "I may tell thee I have no cause to be proud thereof, for if my head would win him a castle in France, it should not fail to go."

On the downfall of Wolsey he was made chancellor, on 25th October, 1529, an appointment which was received with much public approval. As a judge his character was admirable. He was accessible to all, inflexibly upright and impartial, and from the first he refused all bribes and gifts, and even the customary presents. So expeditious was his despatch of business that he not only cleared off all the arrears of his predecessor, but actually worked the

list clear for the first time in the history of the court. The only charge ever brought against him was first promulgated by Foxe, who, in his "Martyrology," accused him of great cruelty in persecuting the Protestants, but though it is admitted by himself that two members of his own household were punished by whipping for their opinions, we have the testimony of Erasmus that "whilst he was chancellor no man was put to death for these pestilent dogmas," which is confirmed by More's own express declarations in his "Apology," published in 1533.

More continued chancellor till 16th May, 1532, when, rather than favour the king's designs to procure a divorce from Catharine and a marriage with Anne Boleyn, he retired from his office. He left it a poor man, but he was enabled to spend a year or two in pleasant retirement at his house in Chelsea, devoting himself to his family and his studies. But he had felt it to be his duty to refuse the king's special invitation to be present at the marriage with Anne, and in consequence he had become a mark for the royal fury. An unsuccessful attempt was made to charge him with bribery, and another attempt, equally unsuccessful, with treason; but in 1534 the Act of Supremacy was passed, and More, who refused to take the oath required by it, was sent to the Tower. After a close confinement of more than a year, he was brought to trial before a special commission and a packed jury, found guilty of high treason, and on the 6th July, 1535, he was beheaded on Tower Hill.

More was the author of numerous works, of which the most celebrated is his "Utopia," first printed in Latin in 1516. It is probable that in the description of a "Happy Republic," which he puts into the mouth of an imaginary Portuguese voyager, we have his views of an ideal society. There is no private property in "Utopia" (Greek for "nowhere"), the mildness of its penal code contrasts strongly with the severity of that of England, and, most significant trait of all, every religious opinion is tolerated. More's English works were collected and printed in one vol. folio by Rastall (London, 1530), and his Latin works were published in one vol. (Basel, 1563; Louvain, 1566; and Frankfurt and Leipzig, 1689). The "Utopia" has been translated into English and several times reprinted. One of the latest editions is the shilling copy in Professor Morley's "Universal Library" (1885).

**MOREA**, the ancient *Peloponnesus*, a large peninsula forming the southern part of Greece, and united to the mainland by the isthmus of Corinth. Its shape has been compared to that of a mulberry leaf, whence some derive its name, and its coast, being deeply indented by numerous gulfs and inlets, forms a multitude of small peninsulas and promontories. The greatest length of the Morea, from the point of Drépanum on the straits of Lepanto to Cape Matapan, its most southern promontory, is 140 miles; and its greatest breadth, from the coast opposite Zante to the easternmost coast of Argolis, near Potos, is about 125 miles. The area is about 9000 miles.

The centre of the Morea forms an elevated table-land traversed by numerous ridges of hills, which inclose spacious basins. On the west of the table-land the valleys have a long slope along the course of the Alpheus and its tributaries, until they merge into the low maritime plains of Elis. On the east of the table-land the descent is rapid. Towards the south the long valley of the Eurotas slopes down to the coast between two ranges of mountains, which detach themselves from the central highland, and, projecting into the sea, form the promontories of Malea and Tanarum. The loftiest summits, Taygetus in the south and Cyllene in the north, are about 5000 feet.

The Peloponnesus, which, before it received that name, was called successively Apia and Argos, received its appellation from the Phrygian Pelops, whose descendants were afterwards expelled by the Heracidae. Its ancient history

forms a part of that of Greece generally. After the destruction of the Achaean League by the Romans (146 B.C.), it was formed, with the rest of Greece, into the Roman province of Achaia, and continued, either really or nominally, a portion of that empire during 1850 years. It was taken from the Byzantine emperors by the Franks at the beginning of the thirteenth century; and, in the division of the conquered lands, the larger part of the Peloponnesus fell to the Venetians, from whom it received its modern name. It was repeatedly invaded by the Turks in the fifteenth, sixteenth, and seventeenth centuries, and was finally confirmed to them in 1718, by the treaty of Passarowitz. With the exception of Maina, the Morea, with the rest of Greece, remained under their sway till 1821, when its inhabitants joined in the general struggle for that independence which at length was established by the treaty of Adrianople in 1829. Various remains of ancient architecture, in the form of dilapidated walls, temples, and forts, exist in different parts of the country, and are described by the general name of *Palatio-Castro*. Of the Cyclopean, or primitive mode of building with uncemented blocks of stone, the chief relics are at Mycenae and Tyrins. At Mantinea the circuit of the walls is still visible; and the outlines of the celebrated field of battle may be traced. The scene of the Olympic games, though not ascertained with complete certainty, was near the influx of the small river Cladeus into the Aipeus.

**MOREAU, JEAN VICTOR**, was born in 1763 at Morlaix in Brittany, of respectable parents. He entered the army at eighteen years of age, and when the Revolution broke out accepted the command of a volunteer legion of the Breton youth, and joined the army of the North. He soon attracted the notice of Pichegru, and rose in two years to the rank of general of division. In this capacity, in the campaign of 1794, he signally distinguished himself at the head of a separate corps of 25,000 men by the rapid reduction of several strong places in Flanders.

After assisting Pichegru in the conquest of Holland, Moreau was appointed commander-in-chief of the army of the Rhine and Moselle, and opened the campaign of 1796 by the defeat of the Austrian general Wurmser at Mannheim. The Archduke Charles of Austria met with no better success, and was completely defeated at Rastadt by Moreau. The Austrians were now largely reinforced, and Moreau finished this campaign by a masterly retreat through the defiles of the Black Forest.

At the commencement of the next campaign he fell under suspicion of being concerned in Pichegru's royalist conspiracy against the Directory; and though he denied it, he solicited and obtained leave to retire from the army. His services, however, were too necessary to be long dispensed with, and he was again actively employed both in Italy and on the Rhine.

On Bonaparte's return from Egypt Moreau consented to join in the revolution of the 18th of Brumaire. He soon afterwards received the command of the armies of the Danube and Rhine, and won from the Austrians the battle of Hohenlinden in 1800. Bonaparte praised him, but looked on him as a rival; and in 1804, being charged with complicity in the royalist conspiracy of Pichegru and Georges Cadoudal against the emperor, he was condemned to an imprisonment for two years, which, by his own request, was commuted into banishment. He retired to America, where he lived tranquilly with his wife and child for several years, until he accepted in 1813 a proposal from the Russian Emperor Alexander to assist the allied armies against France by his counsels. He had scarcely arrayed himself in their ranks when he was mortally wounded at the battle of Dresden, and died in a few days, after bearing the amputation of both legs without a groan.

**MORECAMBE BAY** (in Celtic "the bend of the sea"), a wide inlet of the Irish Sea, on the coast of Lanca-

shire, dividing Furness on the north from the rest of the county. It is 16 miles long by 10 wide, and has high and rapid tides, but is fordable at low water in one part. The town of Fleetwood is at its south-west angle; and it receives the Ken, Lune, Leven, and Wyre rivers.

**MOREL'** (Ger. *Morchel*) is an eatable fungus, called by botanists *Morchella esculenta*. It springs up in orchards, woods, and cinder-walks, early in the spring and summer, and is believed to be most plentiful in places where fires have been made. The country people in Germany were so persuaded of this, that they formerly set fire to woods in order to obtain a crop of morels, of which they are very fond.

**MORE'NA, SIER'RA**, a range of mountains in Spain, forming the great southern buttress of the table-land of the Castiles, and separating the basins of the Guadiana and Guadalquivir. At its eastern extremity it is connected with the Sierra Penaquilla, in which the great Iberian range terminates at Cape St. Martin, and preserves thence towards the west great continuity till on the confines of Portugal it sinks so as to admit the passage of the Guadiana. Rising again it extends through the south of Portugal to Cape St. Vincent, beyond which, for 200 miles out into the Atlantic, there is a submarine ridge, with soundings very shallow over it, but profoundly deep on either side. It bears various local names, as Sierra Carrasqueta, de las Cabras, de Alcaraz, de Cordova, Aracena, &c.; and in Portugal, de Monchique. The maximum breadth in Cordova province is about 70 miles, but the general breadth is not more than 80 to 40 miles; and the elevation seldom passes 5000 feet; the culminating point is in the Sierra Aracena, 38 miles south-west of Llerena—elevation, 5500 feet. In its eastern part, about the meridian of 3 degrees west, it is connected with the Sierra Nevada by the cross range of the Sierras de Segura.

**MOREN'DO** (Italian for "dying away"), a favourite musical term of expression, more vigorous than simple *diminuendo* (growing softer). Thus Shakespeare employs the corresponding Elizabethan musical term, English then supplying all the composer's needs:—

"That strain again, it had a dying fall."

—"Twelfth Night," l. 1.

Milton in "Comus" and Pope in the "Ode to St. Cecilia's Day" use the same figure.

**MORETON BAY**, an inlet, Queensland, Australia, in the Pacific Ocean, protected seawards by the islands of Moreton, Bribie, and Stradbroke, and studded with islets. It is the effluent of the rivers Brisbane and Logan, and its length is 58 miles; greatest width, 20 miles.

**MORETTO** (Italian, the little Moor), the pseudonym of the Brescian painter Alessandro Bonvicino (1498–1555). Il Moretto painted many fine altar-pieces in Brescia, and some excellent portraits, a few of which are in the National Gallery. He was the teacher of the incomparable MORONI.

**MORGAN, AUGUSTUS DE**. See DE MORGAN.

**MOR'GAN LE FAY** (Ital. *Fata Morgana*), one of the supernatural beings of mediæval tales about whom there are most stories. *Fata* is the Low Latin name for a sort of witch or fate-controlling, prophetic being, and the word passed into *fay* or *fee*, our "fairy." The *MIRAGE*, often seen off the coasts of Sicily, &c., was put down to *la Fata Morgana*.

Morgan le Fay was held to be the sister of the legendary Arthur and the daughter of the wizard Merlin. She it was who, with a potion, opened Arthur's eyes to the sin of Launcelot and the Queen Guinevere. It was Morgan also who became enamoured of Ogier the Dane, one of the paladins of the Frank emperor, Karl the Great, and who restored him to youth in her bower of Avalon, allowing him once only to appear on earth and assist Charles Martel to drive back the Saracens from his beloved France. Morgana figures largely in the "Orlando Innamorato" of Tasso,

**MORGANATIC MARRIAGE** (from the old Gothic *morgjan*, to shorten), an alliance between a man of exalted and a woman of inferior rank, with the condition that the latter and her children shall not hold the rank or inherit the possessions of her husband. Such marriages are very common among the German princes, and are sometimes called "left-handed," from a belief that the husband in the marriage ceremony gives his left hand to the woman, and not, as is usual, his right. In the eighteenth century the Duke of Saxe-Meiningen tried to obtain for his morganatic wife the title of duchess, and for her children the right of succession; but the then Emperor of Germany declared that there could be no recognition of marriage in princely families without equality of birth.

**MORGUE, THE**, a building in Paris where the dead bodies of unknown persons found in the river or in the streets are exposed to public view for three days. The bodies are put within a railed space, upon a shelf of black marble, and their clothes are hung over them. The Morgue is always open to allow friends or relatives to come in and recognize the corpses, which they are allowed to take away on payment of the fees. If not claimed they are buried at the expense of the city. The average number of bodies placed in the Morgue is 300 per annum, nearly all of whom are males. The word *morgue* signifies the wicket of a prison, where jailers examine prisoners with a view to identification.

**MORIAH, MOUNT**, the site of the temple at Jerusalem; and also, by tradition, the spot called vaguely "one of the mountains of Moriah" (Gen. xxii. 2), where Abraham sacrificed the ram which miraculously offered itself to the knife raised to slay Isaac. The writer of Chronicles (1 Chron. xxii. 1) gives the choice of the spot to David, and (2 Chron. iii. 1) explains the name Moriah as "Appearance of Yahweh," describing a second manifestation of the Lord at this place—namely, to David. On its summit, on the site of the threshing-floor of Araunah, the temple was built by Solomon with squared stones already cut, so that the building rose almost in silence.

**MORIC ACID** or **MOR'IN** is obtained from fustic (*Morus tinctoria*, natural order Moraceæ), in which it is found associated with morintannic acid, and combined with calcium. It is a white crystalline powder, turning yellow on exposure to air; and is insoluble in water, but soluble in alcohol and ether. The solutions are deep yellow. The formula is  $C_{18}H_{14}O_9H_{20}$ . It combines with alkalis forming bright yellow solutions; papers dipped in these are delicate tests for alkalis. It forms a number of coloured salts.

**MORING'EE** is a small order of plants, belonging to the POLYPTALACE. There is only one genus (*Moringa*), containing three species, natives of North Africa, the warmer parts of West Asia, and the East Indies. One species (the HOARSE-RADISH TREE) is cultivated throughout the tropics. The chief characteristics are the following:—The flowers are irregular; the disc clothes the tube of the calyx; there are five imbricate petals; there are ten perigynous stamens, five of which are sterile; the anthers are one-celled; the ovary is one-celled, with three parietal pæcentæ; the ovules are numerous, anatropous; the capsule is pod-like, with three valves; the seeds are exalbuminous; the species are trees with bipinnate leaves.

**MORINTAN'NIC ACID** is a kind of tannic acid which forms the chief colouring matter of fustic. It is found deposited in the wood. It is a yellow crystalline powder, having the formula  $C_{13}H_{10}O_6$ . It is soluble in water, alcohol, and ether. It melts at  $200^{\circ}$  C. ( $392^{\circ}$  Fahr.), and decomposes at a higher temperature. It is soluble in oil of vitriol, and is precipitated unchanged by the addition of water. Heated with caustic potash it is resolved into phloroglucin ( $C_6H_2O_3$ ) and protocatechuic acid ( $C_7H_4O_4$ ). It forms a number of salts called morintannates, the solutions of which usually turn black on exposure to air.

**MOR'ION**, an iron head-piece, round or basin-shaped, fitting somewhat closely to the head (Spanish *morra*, the crown of the head), and without a vizor. It was invented by the Spaniards in the sixteenth century, and soon became a favourite head-piece for soldiery. The Parliament troops in the great Civil War were very generally protected by morions. Some were peaked, coming to a point at the top, but the majority had a high crest rising all across the middle, lengthwise, and curving sides to protect the cheeks and ears, while leaving the eyes and mouth free. The rim also slanted outwards, to give a slanting direction to any chance blow.

**MORIS'COS**, the Spanish name for the descendants of the Moors who remained in Spain after the taking of Granada in 1492. By the terms granted to the city of Granada they were to retain their own religion, laws, customs, language, and national dress. These terms were soon disregarded by the conquerors, and means were taken to make the Moors adopt the religion of the Cross. For this purpose persuasion was first tried and failed; then the powers of the Inquisition were extended, and many thousands of Moors, brought before it under a charge of infidelity, were put to death. The great bulk of the unfortunate people, however, outwardly professed Christianity, in order to save their lives and property. But by a royal decree, dated September, 1556, the New Christians, as the Moriscos were sometimes called, were ordered to learn and use the Spanish language; their Arab books were condemned to be burned; the Christian dress was to be adopted; the Moorish women were to go about the streets *unveiled*; and the men were to renounce their Mohammedan and adopt Christian names. This decree led to a fierce insurrection in the Alpujarras, which was not put down till 1570. Finally, as neither persuasion nor force was able to make them sincere Christians, the Moriscos, to the number of 800,000, were conveyed in the royal galleys from Spain, and landed on the shores of Africa, according to a decree of Philip III. in 1610; and thus Spain was deprived of one of the most industrious portions of her population—a policy from the ruinous effects of which she has never recovered.

**MOR'KERE**, son of Ælfgar, the deposed Earl of Mercia, was himself chosen Earl of Northumbria when Earl Tostig (brother of Earl Harold, afterwards the last of our old English kings) had by tyranny worn out the obedience of his subjects (1065). Morkere's brother Edwin was earl of his father's former earldom of Mercia. The two earls joined together, and Harold consented to the banishment of Tostig rather than risk a civil war, for Edward the Confessor was at the point of death, and he himself was marked out as his successor. Morkere and Edwin were false to Harold when he came to the throne, though he had sought to conciliate them by marrying their sister, and left him without their support at the battle of Senlac, to their eternal shame. They promised to support Edgar Atheling as king at the subsequent witan of London (1066), but as soon as William of Normandy advanced they abandoned the stout men of London and retired to their earldoms, taking with them Harold's widow, their sister Eadgyth, thus throwing away England's last chance against the Norman. Edgar wisely abdicated, and William was crowned on Christmas Day, 1066, at Westminster. The traitor earls came up and did homage, and were confirmed in their earldoms. But William, who despised traitors, never afterwards trusted them. They were usually kept at his court in honourable gilded durance. Morkere joined Hereward le Wake in a revolt in 1071, during one of William's absences abroad. The revolt was quickly subdued, and Morkere formally banished to Normandy, where he died. Hereward, a noble enemy, was, on the other hand, not only pardoned, but received into the Conqueror's favour.

**MORLAIX**, a town of France, in the department of Finistère, very prettily situated at the foot of two hills, and at the junction of the Jarleau and the Kerlent, which throw their waters into a creek from the English Channel, from which the town is distant about 7 miles. Morlaix still retains an appearance of antiquity, and from being situated in a valley with steep and wooded hills rising close behind the houses, is very picturesque. There is a town library, hospital, tobacco factory, paper, flax, and saw mills, and some canvas factories and foundries, and a fair coasting trade. The port has 18 feet of water at neap tides, 23 at spring. A remarkable two-storeyed railway viaduct passes over the town. The population in 1886 was 14,671. After a raid of the English in 1522 upon Morlaix and its neighbourhood, 600 of the hindmost of the invaders were intercepted by the infuriated inhabitants and cut off with great slaughter near a spring still called Fontaine des Anglais, or, as the Bretons, like their Welsh kinsmen, style them, the Saxons.

**MORLAND, GEORGE**, the painter (1763-1804), was the son of Henry Robert Morland, an indifferent painter, from whom he received his first instruction. He first painted landscapes and one or two small conversation pieces, his favourite subjects, however, were domestic animals, horses, dogs, pigs, &c., which he depicted in a masterly though often deplorably careless manner. Morland was a master of the mechanism of the art. With a correct eye for effect, he observed and executed with equal rapidity; and though he was without imagination, he rendered his subjects interesting by faithful expression of their essential character and picturesque arrangement. His moral character was low.

**MORLEY, THOMAS**, a distinguished early composer, and author of the first regular treatise on the art of music that appeared in the English language, was born probably about the middle of the sixteenth century; our information concerning him is, indeed, remarkably scanty, the celebrity of his works being considered. All that is known is gathered from Wood, who, in his "Athenæ Oxonienses," tells us that he was a pupil of the much-esteemed BYRN, to whom he dedicated his book in very reverential and affectionate terms; that he obtained a bachelor's degree in music in 1588, and was sworn into his place as gentleman of the Royal Chapel in 1592. He died in or near the year 1601.

Morley's compositions include the fine "Funeral Service," the first that was set to the words of our reformed liturgy; and "Consort Lessons," made by divers exquisite authors, for six different instruments to play together—viz., the treble lute, pandora, cittern, base-viol, flute, and treble-viol. Between 1598 and 1600 he published several books of original canzonets, ballets, and aires, in from two to six parts, some of them being so successful as to demand a second edition almost at once. Many of these are among the very first examples of this golden age of English music, such as "My Bonny Lass," "Fire, Fire," &c., still prime favourites with our chorists of to-day. He edited that collection so familiar to madrigalists, "The Triumphs of Oriana" (1601). In Queen Elizabeth's "Virginal Book" are five sets of "lessons" by Morley. But the work on which his fame is chiefly built is that alluded to above, "A Plaine and Easie Introduction to Practical Musick" (folio, 1597).

**MORMONS, THE**, a sect of religionists, principally established in UTAH, a territory bordering on the Great Salt Lake, and annexed to the United States of America. The circumstances attending their origin and history are of the most remarkable and interesting character; while at the present day their attitude towards the government of the United States is a source of much perplexity to the statesmen of that country.

They were originally founded by Joseph Smith, who was

born 23rd December, 1805, at Sharon, Windsor county, Vermont. Ten years later his parents, ignorant and thriftless people, who had a bad reputation among their neighbours for idleness, intemperance, and dishonesty, removed to Palmyra, in the state of New York, and four years later to the town of Manchester, about 6 miles off. It was at Manchester that Joseph Smith, who until then had borne his full share in the bad repute of his family, began at the age of fifteen to profess to receive supernatural visions. According to his own account, given afterwards, on the night of 21st September, 1823, an angel appeared to him, who, in addition to many other important revelations, informed him that a supplement to the New Testament, a book which should be the Bible of the Western continent, was buried "on the west side of a hill, not far from the top, about four miles from Palmyra." This book, after he had passed through four years of disciplinary probation, was delivered into his hands by the angel, in the shape of a volume of thin gold plates, 8 inches long by 7 wide, bound together by three rings running through the whole, the volume being about 6 inches in thickness. A portion of the book was sealed, but the unsealed portion was covered with small, beautifully-engraved characters, the writing being in the "reformed Egyptian" language. Together with the book he received a pair of supernatural spectacles, consisting of two transparent stones set in a silver bow, and called Urim and Thummim, by means of which he was enabled to read and understand the mystic writing. Being himself but an indifferent penman, Smith employed a man named Oliver Cowdery to write down the translation from dictation, Smith sitting behind a blanket hung across the room, in order to hide the mystic volume from profane vision. A farmer named Martin Harris having supplied the necessary funds, the book was published in 1830 under the title of "The Book of Mormon," accompanied by a sworn statement on the part of Oliver Cowdery, David Whitmer, and Martin Harris to the effect that an angel had shown them the original plates. All three men subsequently abandoned Mormonism and declared their testimony to be false; and though some eight other persons afterwards declared they had seen the gold plates, it is certain they were never seen by any trustworthy independent person, and the Mormons lay no claim to their possession. "The Book of Mormon" professes to contain the primitive history of America from the dispersion at the Tower of Babel until the beginning of the fifth century of the Christian era. The original settlers, called Jaredites, were a wicked and quarrelsome race, and after a series of prolonged wars they were nearly all destroyed. About 600 B.C. a small band of fresh settlers, consisting of a Jew named Lehi with his wife, his four sons and their wives, and a few friends, arrived in America, having come direct from Jerusalem, and from these and their descendants the land was repopulated. After the death of Lehi the Lord appointed the youngest son, Nephi, to be the leader of the new race; but his elder brothers refused to accept him, and in consequence were condemned to have dark skins and become an idle, mischievous, and cunning people—hence the North American Indians. The descendants of Nephi and his rebellious brothers increased and multiplied, but there was always continuous war between the two races; and though after the crucifixion Christ appeared in person to the Nephites and planted his church in their midst, they afterwards fell away from the true faith, and in 384 A.D. were almost exterminated in a great battle which took place at the hill of Cumorah, in Ontario county, New York. Among the few who escaped this massacre were the prophet Mormon and his son Moroni, the former of whom wrote an abridgment of all the sacred records of the Nephites, which was completed by Moroni and buried in the hill of Cumorah, where it was found by Smith.

The actual origin of "The Book of Mormon" has been

traced to a historical romance composed by an eccentric American preacher named Solomon Spalding, who died in 1812. His book never got beyond the MS. stage, but it seems to have come into the hands of Smith through his friend Sidney Rigdon, an unscrupulous compositor, who had tried to start a little sect of his own. It is this romance which forms the basis of "The Book of Mormon," but Smith added and interpolated a good deal of his own matter.

Provided with a new revelation and, according to his own account, invested with prophetic and miraculous power, Smith soon began to attract followers, and by 6th April, 1830, was able to organize the first church of the Latter Day Saints at Fayette, Seneca county, New York. The same year Smith began to baptize, and in obedience to a revelation moved with his followers to Kirkland, Ohio, where they established a small settlement. Another revelation directed the saints to consecrate all their property to God and to start a bank, of which Smith was appointed president. The new doctrines were vigorously proclaimed up and down the country, and despite the fierce opposition of the orthodox preachers, and the brutality of people of the baser sort, converts came in in large numbers, and churches were established in the states of Ohio, Pennsylvania, New York, Indiana, and Missouri. In 1833 the church was fairly organized under the presidency of Smith, Rigdon, and F. C. Williams, and it had received an important accession in Brigham Young, a Vermont painter and glazier, whose ability was so manifest that he was at once ordained an elder. In 1835 twelve apostles were appointed and sent out as missionaries, Young being ordained as one of them and sent to the Eastern States. In 1836 Orson Hyde and Heber C. Kimball were sent as missionaries to England, and they made an immense number of converts among the labouring masses in the great manufacturing towns in the northern counties, and among the mining populations of South Wales. Early in 1838 the Kirkland bank failed, and Smith and Rigdon fled to the Mormon settlement in Missouri. Here the Mormons and the Gentiles became engaged in such conflicts that the state militia had to be called out, and Smith and Rigdon were arrested on a charge of treason, murder, and felony. The Mormons, to the number of 15,000, crossed over into Illinois and settled near Commerce, Hancock county, where they were joined by Smith, who escaped from prison. Here Smith obtained a charter for the founding of a city, and the Mormons commenced, 11th June, 1839, the foundations of their town of Nauvoo, which was soon in a very flourishing condition. The original "Book of Mormon" had contained, among other matters, a condemnation of polygamy; but Smith in the interval had prevailed on several women to cohabit with him, and in July, 1843, he professed to have a fresh revelation establishing polygamy as part of the new system. The proclamation of the new doctrine was strongly condemned by the *Expositor*, a newspaper published at Nauvoo, and Smith at once caused the office to be destroyed and the proprietor expelled. The latter procured a warrant for the arrest of Smith, his brother Hyrum, and sixteen of the Mormon leaders, but the Mormons armed themselves and offered resistance. In the end Smith and his brother Hyrum were persuaded by the governor of the state to surrender for trial, the governor pledging himself to insure their personal safety. They were accordingly lodged in Carthage jail, 27th June, 1844; but the same night a body of men from the surrounding country broke into the prison and shot the two men dead.

This event, instead of daunting the Mormons, only united them more closely together. Brigham Young was elected leader in the place of the departed prophet, and he, finding the persecution likely to increase in violence, sent out exploring expeditions to find a place for a new settlement.

In 1846 the greater portion of the Mormons moved into Iowa, and the remainder were driven out of Nauvoo by force the same year. By this time a favourable report of the Great Salt Lake Valley had been received, and in 1847 a large body of emigrants set out, under military discipline, for their new home. They were joined by the main body the following year, and though their journey was attended with terrible hardship, they had no sooner arrived than they set to work with wonderful diligence, and soon effected great results. When they arrived, the plain around Great Salt Lake was not merely a solitude but an arid desert. The levels and hill slopes, for a height of 3000 feet above the lake, were covered with sage, brush, and other dry and prickly plants; there were no trees, scarcely any grass, and little water except in a few streams descending from the mountains. But Brigham saw that the soil was naturally fertile, and only needed irrigation to make its fertility available. Under his energetic guidance and iron rule the land was cleared, the foundations of the Salt Lake City were laid, agriculture was begun on a comprehensive scale, and soon the barren wilderness was converted into a fertile and blooming garden. In 1849 a constitution was adopted, and a state was organized under the name of Deseret, meaning "the land of the honey bee," and though Congress refused to admit the new state into the Union, President Fillmore, in 1850, organized the country occupied by the Mormons into the Territory of Utah, with Brigham Young as governor. District judges were appointed, but these were quickly compelled to leave by the Mormons; and when afterwards certain new Gentile governors were appointed by the Federal government and supported by troops, the Mormons offered so stout a resistance that they were unable to effect anything, and were compelled to leave Utah. In 1857 a new governor was sent at the head of 2100 men, but Brigham Young called the Mormons to arms, cut off the supply trains of the army, captured its cattle, and compelled it to go into winter quarters near Fort Bridger. The same year a party of 150 non-Mormon emigrants were attacked by a mixed force of Mormons and Indians under J. D. Lee, a Mormon bishop, at Mountain Meadows, near Utah, and massacred to a man. In 1858 the Mormons were induced to submit by the offer of a free pardon, and the Federal troops encamped 40 miles from the Salt Lake City, where they remained until 1860, when they were withdrawn. After the Civil War the United States government made several spasmodic attempts to assert the supremacy of Federal law in Utah, and abolish the polygamy prevailing there, but these efforts were attended with very little success. Even when the discovery of valuable mines in the neighbouring mountains, and the carrying of the Atlantic and Pacific Railway across the continent, brought a large accession to the Gentile population, the Mormons continued to manage matters pretty much as they pleased. Their attempts to procure recognition as a separate state were, however, persistently rejected by Congress, and a permanent camp was maintained in sight of Salt Lake City, in order to keep the Mormons in awe. In 1871 an attempt was made to prosecute the leading Mormons for bigamy, but it ended in failure, and the sect continued to increase in numbers and to maintain its peculiar institution until 1877, when it lost its able leader, Brigham Young, who died 29th August, leaving seventeen wives, fifty-six children, and a fortune of £400,000. The same year the Federal law was vindicated by the trial, conviction, and execution of J. D. Lee for the Mountain Meadows massacre of 1857. After the death of Young, an Englishman, John Taylor, was elected to his office; but the actual leadership fell to G. Q. Cannon, an able and eloquent member of the body, who had formerly represented Utah in the United States House of Representatives.

The territory of Utah embraces an area of about 80,000



square miles, but much of this is barren and useless, and though the soil is fertile where it can be brought under the influence of irrigation, the available rivers are not very numerous, and the territory is incapable of supporting a large population from the products of its own soil. The Mormons, however, have sent out numerous colonies from their central home at Utah, and many of the valleys of Colorado, Arizona, Idaho, Wyoming, and Montana have been appropriated by them. By the census of 1880 the population of Utah was returned at 143,968 persons, of whom about 123,000 were Mormons. Their number in the United States outside of Utah is estimated to be somewhere about 27,000. They have in addition some flourishing missions in Europe, and their entire number cannot be much less than 220,000, a wonderful number when it is considered that it represents the growth of but little more than half a century. During the early years of the sect most of the converts were native Americans, but latterly the majority have been obtained from among the poorest classes of Great Britain, Scandinavia, Germany, and Switzerland. A smaller but still considerable number have been obtained from the Southern States. Very few Irish are said to be found among the Mormons, and their missions have generally been failures among Roman Catholics. The converts made in the mission fields are sent over whenever it is possible to America, and some 8000 or 4000 are thus annually received.

The form of the Mormon government is theocratic, and church and state are one. The hieratic priesthood is divided into two heads, of which all other officers and authorities are appendages. The first is called the Melchizedek priesthood, and includes the high priest, priests, and elders; the second is the Aaronic or Levitical priesthood, and includes the bishops, the teachers or catechists, and the deacons. The hierarchy culminates in the first presidency, that is, the president, high priest, seer, and prophet, and his two counsellors, supposed to be the successors of Peter, James, and John, in whom centre all temporal as well as ecclesiastical power. Next comes the patriarch, whose chief duty is to bless and lay on hands, and after him the "twelve apostles" or travelling counsellors, of whom the president is *ex officio* one and endowed with authority equal to the other eleven. The apostles ordain all other officers, lead all religious meetings at which they are present, and administer the rites of baptism and the sacrament. The fourth body is the seven presidents of the "seventies," each body comprising seventy elders. The seventies are the chief missionaries and propagandists of the order. Fifth come the "high priests," who are charged with the immediate administration of spiritual affairs. The elders are priests whose activity and zeal have been rewarded by promotion. After the high priests come the bishops, who receive and administer the funds of the church, the chief item of income being the tithe, which amounts to over £220,000 annually, and under the bishops are the two minor offices of teachers and deacons. The Mormons have a chronology of their own and date from the year 1830, which is year one of the era of the Latter Day Saints.

The doctrines of the Mormons as they have been developed since the days of the founder represent a queer medley of superstitions gathered from many sources, and the modern Mormons hardly claim to be Christians at all. To students of comparative theology, the rise and growth of the Mormon system present many points that are profoundly interesting, though to outsiders much of their teaching is obscure and uncertain. The Mormon supreme deity is described as being an advanced and glorified man, and is identified by them with the primeval Adam of Genesis. After him come a number of lesser deities, among whom are included Jesus Christ, Mohammed, Joseph Smith, and Brigham Young, all of whom are regarded as partaking

more or less of divinity. The saints on leaving this world are deified, and each saint is capable of rising high enough to become the god of a separate world which he will make, people, and rule for ever. The sexual relation is extended to the deities of all grades, and part of their work is believed to be the propagation of souls to inherit bodies formed upon the earth or in other worlds. The opposition from the outside world to their practice of polygamy has intensified their adherence to it, and a doctrine has been promulgated to the effect that the glory of a saint in the next world will be in proportion to the number of his wives and children in this. Mormons are further required to believe in the Bible as supplemented by the "Book of Mormon" and the "Book of Doctrine," in the gift of prophecy, miracles, and casting out of devils; in the imminent approach of the end of the world, in the millennial reign of Christ, in the literal resurrection of the body, and in the salvation of a man only if he believes in the atonement of Christ, repents, is baptized by immersion by a Christ-appointed apostle, and receives from a duly appointed apostle the laying on of hands for the gift of the Holy Ghost.

Most independent witnesses unite in their testimony as to the wonderful work done by the Mormons in the improvement of the territory they occupy, to the industry of the people, and to the high level of comfort maintained among them. Nor can there be any question as to the sincerity and enthusiasm of the great mass of the population or of their devotion to their leaders. But on the other hand it is equally evident that many of the leaders are cunning, selfish men, who use the church simply as a colossal political and commercial machine through which they may hold control over the minds and the labours of their followers, and by the sanction of which they may give unrestrained indulgence to their sensuality. To maintain their power they have scrupled at no crime, as the many murders committed by their emissaries have proved, and it is to this end that they still keep the majority of their followers in ignorance, and insist upon prompt unreasoning obedience in all things as a necessary duty of religion. The suppression of the evil features of this organization by legislation seems at present impossible, but other means are now at work which it is hoped may be more effectual. The barrier of isolated exclusiveness has now been removed, freedom and order are maintained by an adequate national force, the country is open to the trader and the schoolmaster, and these influences will probably do more towards breaking up Mormonism than either persecution or legislation has hitherto accomplished.

**MORNINGTON, GARRETT WELLESLEY, EARL OF**, was born in Meath about 1720, and advanced from the dignity of an Irish baron to that of an earl in 1760. While yet a child he displayed a great love for music, and so distinguished himself as he grew older that the University of Dublin conferred on him the degree of doctor in music, and subsequently elected him professor of that faculty. He died in 1781. Lord Mornington's compositions are chiefly vocal. He excelled most in the glee. His famous glee "Here in cool Grot" gained the gold medal given by the Catch Club in 1779.

**MORO, ANTONIO (Antonis Mor)**, called in England *Sir Antony More*, was born at Utrecht about the year 1512, and was the pupil of Jan van Schoor. He obtained a great reputation at Rome as a portrait painter, but on his return to Holland was much influenced by Holbein. In 1554 More was sent to paint Queen Mary of England, by whom he was probably knighted, and whose court painter he became. Some of his pictures, and very good ones, are in the National Portrait Gallery. More was a Dutchman by birth, but a Fleming (that is, an Italianized Fleming) in art. His only rival at Mary's court was Joost van Cleve of Antwerp. He died at Antwerp in 1578.



**MOROCCO** or **MAROC**, called by the natives *Maghrib-el-akṣá* ("the furthest west"), or briefly *Maghrib*, whence the inhabitants are called *Maghribins*, is an empire in Northern Africa, extending roughly from S. to N. between 27° and 36° N. lat., the most northern districts forming the southern coast of the Straits of Gibraltar; and from E. to W. between 0° 30' and 11° 50' W. lon. On the N. it is bounded by the Mediterranean, N.W. and W. by the Atlantic Ocean, S. by the Sahara, and E. by Algiers. Its surface has been estimated at 800,000 square miles, and the population at 6,000,000, comprising Moors, Berbers, and *Shelluhs*, *Bedouins*, Jews, and Negroes.

**Surface and Rivers.**—The surface of this extensive country is extremely diversified by mountains, hills, plains, and valleys. The *ATLAS* traverses it in its greatest length. The whole coast-line along the Mediterranean, which from Tawunt to Cape Sparte is about 320 miles, is high and rocky. Level tracts of inconsiderable extent occur chiefly at the mouths of the small rivers. Throughout the empire there are, however, some fine plains and valleys.

The river *Muluya*, which rises at or near the southern extremity of the Lesser Atlas, and runs northward into the Mediterranean Sea, has a course of about 400 miles. It is the only considerable river which falls into the Mediterranean. Seven rivers fall into the Atlantic Ocean, viz. *El Kos*, *Bu-Regreb*, *Oom-er-begh*, *Tensift*, *Susc*, *Draha*, and *Sebou*; they have lengths of from 100 to 300 miles. From the southern declivity of Mount Atlas descend three other rivers, the *Fileli*, *Ziz*, and *Gir*.

**Climate, Productions, &c.**—The climate is healthy, and not so hot as might be expected from the position of the country. A great part of the empire is subject to the alternation of the sea and land breezes, and those districts which lie beyond their reach are cooled to some extent by the winds which blow from the mountains. The temperature is seldom above 85° or below 40° Fahr. The seasons are divided into the dry and wet. The wet is at the time of the English winter. The soil in the valleys was celebrated in antiquity for its great fertility; but owing to misgovernment the profits of agriculture are most uncertain. The principal articles cultivated are wheat, maize, millet, beans and pease, barley, dates, grapes, olives, sugar cane, cotton, tobacco, the fruits of southern Europe, especially the fig and pomegranate, cork, henna, hemp, and saffron. Much of the country is suitable for the cultivation of cotton. The grass lands are rich, and feed a race of horses, once fine, but now neglected, besides large numbers of sheep, goats, oxen, and mules. Camels and asses are the principal beasts of burden. Domestic animals of every kind are numerous. In the large uncultivated tracts wild animals abound, as lions, panthers, hyenas, wolves, and several species of antelopes and deer, as well as monkeys and wild boars. *Ostriches*, cranes, storks, and locusts are also found in large numbers.

The minerals of Morocco consist of iron, copper, lead, gold, rock salt, and antimony. Timber for building is not abundant, and is imported from Spain.

The population consists of various races. The Moors form more than half. They are distinguished by a complexion of the deepest olive, fine features, an apathetic appearance and indolent disposition, but are capable of being roused to the extremity of fiery passion. A woollen cloak, called a *haïque*, thrown over the shoulders and fastened round the body, of various colours, a pair of yellow slippers, and a white turban, with a red or green centre, are the principal parts of the ordinary costume. The country Moors, who lead a pastoral life, or are cultivators, are of more active habits than the people in towns, indulge in horsemanship, military evolutions, dancing, and music plaintive in its strain. Next in numbers are the Berbers, a portion of whom on the Riff coast are savage wreckers. Jews abound in the cities and towns, who have the greater

part of the trade of the country in their hands, and are the medium of foreign commercial transactions. They swarmed over from Spain upon being expelled from that country by the unwise policy of Ferdinand and Isabella in 1492, and contrive to amass wealth, though most grievously maltreated by the dominant race, robbed with impunity, cheated without redress, and compelled to pay mortifying attentions in public to the observances of a religion they consider false. In 1864 a benevolent mission of Sir Moses Montefiore from London to the court of Morocco secured for his brethren the promise from the government of its influence being exerted for their protection from injustice—a promise which was practically almost worthless, the influence of the government being so trifling. In 1881, on hearing of the severe persecutions of Jews in Russia, King Alfonso XII. announced his opinion that a great mistake had been committed by his illustrious predecessors in 1492; and on his intimation that Spain would afford a secure asylum for the despised race, many of the Morocco Jews crossed to the land of their forefathers, where their usefulness, in the impecunious state of Spain, is much appreciated.

The empire is composed of the two kingdoms of Fez and Morocco, and three other territories. The whole country is subdivided into thirty governments, each under the superintendence of a "caid," whose chief duty is to collect the imposts; but the semi-independent tribes are ruled by their own chief, and scarcely acknowledge the authority of the sultan. The principal cities and towns are Morocco, Fez, Mequinez, Rabat, Saffé, Salée, Tarudant, Tetuan, Tessa, Mogadore, El-Araish (improperly *Laraiche*), Mazagan, and Tangiers.

As the inhabitants dress chiefly in woollen materials, the manufacture of woollen cloth is general, but the material is usually coarse. It is made up into haïques and jellabs, sashes and handkerchiefs, slippers, carpets, and floor-mats. The tanning of hides, and the preparation of the well-known Morocco leather, are important branches of native industry. In the latter the Moors far surpass the Europeans. It is made extremely soft and white by the use of two species of plants indigenous to the soil, and receives red, green, and yellow dyes, remarkable for their brilliancy and durability. The red dye is extracted from the *termes*, an insect caught on the mountains and brought to the town for sale. The potteries of Fez are considerable, and the ware which they produce is not wanting in a certain degree of elegance. A coarse description of earthenware is manufactured in the district of Riff, and extensively used throughout Morocco.

The chief articles of export from Morocco are wood, maize, millet, beans, pease, almonds, gums, hides, skins, oil, wax, dates, leeches, ostrich feathers, haïques, woollen sashes, and slippers. Besides these, oxen and provisions are largely exported to Gibraltar for the use of the garrison. Candles, cloth, coffee, manufactured and raw cottons, iron, silk, sugar, and tea form the more important staple commodities imported.

In 1856 a treaty of peace and convention of commerce between Great Britain and Morocco was signed, and from this time an improved condition of the trade dates. Absolute freedom of purchase and sale is now conceded to all, and the rigid law that forbade all mining enterprise, or even the search for minerals, in which the country is known to be rich, has been relaxed. In 1878, when Sir Joseph Hooker received a firman allowing him to explore the Atlas Mountains, it was expressly stated that he was not to examine any stones or minerals, but later on the emperor granted a concession to some English capitalists to search for coal. These are all favourable signs, but although so richly endowed by nature, and so admirably situated geographically for purposes of trade, Morocco is still singularly low in the scale of trading countries.

The standing army amounts in time of peace to 15,000 or 20,000 men; in war to 80,000 or 100,000, mostly negro slaves. The navy is now insignificant, though it was once formidable, and was chiefly occupied in piracy.

**Government, Education, &c.**—The government is absolutely despotic. Punishments are of a very barbarous character. The sovereign assumes the title of Vicegerent of God upon Earth. The title is hereditary in the male line, but does not necessarily descend to the eldest son.

The present dynasty of Morocco descends from Hassan, sheriff of Tafflet, who obtained the throne by conquest in 1647. Claiming descent from the family of the Prophet, the sultan enjoys great distinction in the Mohammedan world, being frequently regarded as the only lawful caliph and the chief of Islam. The slavery of Christians was abolished in 1814, and piracy prohibited in 1817. The Emperor of Morocco joined with Abd-el-Kader in the wars with the French in 1844, when Tangiers was bombarded. From 1851 to 1866 the Riff pirates caused difficulties with Algeria and Spain. Morocco was invaded by an army from the latter country, and Tetuan taken in 1859. A peace was, however, concluded in the following year, highly advantageous to the Spaniards. The Grand Sheriff of Wazan is the highest spiritual authority. He is of almost equal rank with the sultan; indeed, by many he is placed above him, for he is the direct descendant of the Prophet, his genealogy being traced back in an unbroken line to Ali, the nephew, and Fatima, the daughter of Mahomet. The emperor receives him alone among men as his equal, and appeals to him for assistance in times of difficulty, his mere presence during an insurrection having been found of more avail than an army. His authority is recognized in India, Egypt, Arabia, Tunis, Algeria, and, indeed, in all Mohammedan countries of which he is the acknowledged chief. The Sultan of Morocco and his subjects differ from the followers of Mahomet in Turkey, Persia, and other countries by adopting as their text-book of faith the commentary upon the Koran by Sidi Bokhari. Education in Morocco is at a very low ebb, the Koran being the principal text-book. Children are taught a few chapters by heart, which, in many cases, completes their education. Some go through a higher training in order to become scribes and fitted to fill public offices. It is worthy of notice that by decree of the French government all natives under French protection, or in any way employed under the flag of France, are compelled to liberate all their slaves. The Maghribins carry on a very active commerce with the Soudan or the interior of Africa, and with Egypt and Arabia, by caravans. The numerous caravans which go once a year to Mecca are chiefly composed of pilgrims.

MOROCCO, one of the capitals of the empire of the same name, is situated on level ground, 4 miles south of the river Tensift, and is surrounded by a strong wall 30 feet high, 6 miles in circumference, and having eleven gates, with square turrets at every fifty paces. The streets are narrow and irregular. Several open places are used as market-places. The houses, which are only of one storey, have flat roofs and terraces. Inside the wall are many large fields and open spaces strewn with ruins. Outside the city are extensive cemeteries, and a quarter appropriated to lepers. The population is estimated at 50,000, many of whom manufacture leather and embroidery, which, with salt, are the chief articles of trade. The principal edifices are the emperor's palace, and twenty mosques, two colleges or medrasas, and one hospital for 1500 patients. The principal mosque, El Kontubia, is distinguished by a lofty tower, 220 feet high, a masterpiece of Arabic architecture. There is also a fine bazaar.

Morocco, which is supposed to be situated on or near the spot occupied by the ancient *Bocanum Hemerum*, was founded in 1052 by Abu Tessimin, the first Moorish sultan of the Marabou dynasty, and in the following century during

the reign of Ali Ben Yusuf, it is said, but no doubt the statement is grossly exaggerated, to have contained 1,000,000 inhabitants. In later times its population greatly decreased; and owing to the devastations of successive conquerors, it retains little of its ancient magnificence. At present it is in many parts little else than a desert; the ruins of houses heaped one upon another serve to harbour thieves and desperadoes of all sorts. Nothing but the wretched government of Morocco could have made so great a city so miserable and so deserted.

**MOROCCO** (Fr. *marroquin*), a species of goat-skin leather, originally from Morocco, the Barbary states, and the Levant. It is now manufactured in most countries, and extensively employed in binding books.

**MORO NI, GIOVANNI BATTISTA** (1510–78), is, next to Titian and Rembrandt, the finest portrait painter of the great age. The National Gallery fortunately possesses several of his very best works; the "Tailor" and the "Lawyer" are almost unequalled. The first is indeed held to be the painter's masterpiece. Moroni was a pupil of Bonvicino, called MORETTO.

**MORPETH**, a municipal and parliamentary borough of England, in the county of Northumberland, 15 miles north by west from Newcastle, and 292 miles from London by the Great Northern Railway, stands on a peninsula formed by the windings of the River Wansbeck, over which there are a stone and two wooden bridges. The municipal borough is governed by four aldermen and twelve councillors. The church, nearly half a mile from the town, dates from the fourteenth century. In the southern suburb stands the former county gaol, near which are the remains of Morpeth Castle. The town contains a town-hall, a free grammar-school, dispensary, savings-bank, and mechanics' institution. The industrial resources of the town are brewing, malting, tanning, iron-founding, and the manufacture of flannel. Near the town is the Northumberland Lunatic Asylum. The population of the parliamentary borough, which returns one member to the House of Commons, in 1881 was 33,459. The municipal borough has only 4556 inhabitants.

Morpeth, said to mean the path over the moor, was of some importance before the Norman Conquest. It was burned down by its inhabitants in 1215, in order to distress King John when on his march to punish the revolts of his barons, and it again suffered from fire in 1689.

**MORPHINE** or **MORPHIA**, an important alkaloid obtained from opium, in which it exists in combination with meconic acid. It is obtained by exhausting the opium with water, and precipitating the meconic acid as meconate of calcium by calcium chloride. This is filtered off and the solution evaporated. The hydrochlorate of morphine contaminated with that of codeine crystallizes out; the crystals are purified by recrystallization, dissolved in water, and the morphine precipitated by ammonia, and finally crystallized from solution in alcohol. The best Smyrna opium contains 10 to 15 per cent. of morphine. Morphine crystallizes in colourless trimetric prisms. It has an intensely bitter taste, and is a strong narcotic poison. It is slightly soluble in cold water and alcohol, but insoluble in ether. It is also very soluble in caustic potash. The formula is  $C_{17}H_{19}NO_3$ . It is a strong base, forming neutral salts, most of which are crystallizable and bitter, and soluble in water and alcohol, but not in ether. The principal salts used in medicine are the following:—Hydrochlorate of morphine ( $C_{17}H_{19}NO_3 \cdot HCl \cdot 3H_2O$ ), crystallizing in silky needles; sulphate of morphine  $2(C_{17}H_{19}NO_3) \cdot H_2SO_4 \cdot 10H_2O$ , crystallizing in colourless prisms; acetate of morphine, crystallizing in silky tufts; meconate of morphine, uncrystallizable; hydrobromate of morphine, a white amorphous powder; tartrate of morphine ( $C_{17}H_{19}NO_3 \cdot C_4H_4O_6 \cdot 3H_2O$ ), crystallizing in minute needles. The oleate of morphine is also used for external application to relieve pain. All the other salts

as well as the alkaloids are much used in medicine as sedatives and narcotics, and are taken internally in doses of one-eighth to half a grain, and also administered by hypodermic injection. The meconate and hydrobromate are said to cause less disturbance to the head and less gastric derangement. Atropine is antagonistic to morphine, and in cases of poisoning may be used as an antidote in very small doses administered hypodermically. Coffee and tea are also antagonistic. The presence of morphine may be detected by its reaction with iodic acid, which is reduced, free iodine being separated. This may be detected by the blue colour formed with starch; no other part of morphine may be detected in this way. Morphine is distinguished from narcotine, which accompanies it in opium, by its insolubility in ether; and from codeine by its precipitation by ammonia.

**MORPHOLOGY, VEGETABLE**, is that department of science which contemplates the laws regulating the forms of plants and of their particular parts. In the earlier period of the history of botany, plants were studied as individuals, or groups of individuals, without any reference to the general laws which governed either their external or their internal forms, or those which influenced the production of various forms in the same individual at different periods of its existence, or of the same species under varying circumstances.

Linnæus, although he never made any practical application of his idea, seems to have been the first to have suspected that the varied forms of the flowering organs, and even other appendages of the axis of the plant, were modifications of the leaf. In his "*Philosophia Botanica*" occurs the following remarkable passage:—"The origin of the flowers and the leaves is the same, the origin of the buds and the leaves is the same; the bud consists of the rudiments of the leaves, the flower comes from the rudiments of the leaves united." Although the doctrine of morphology, to a limited extent, was thus aphoristically proclaimed by the great Swede, and many facts pointed out by him to prove its truth, yet little or no notice was taken of this department of science by his followers. Goethe frequently occupied himself with natural history studies; and in one of his letters, dated 1786, mentions that he believed he had discovered "the whole secret of the generation and organization of plants, and that it is the simplest thing that can be imagined." In 1790 he published his pamphlet on the metamorphoses of plants, in which he distinctly states the great law of morphology, that every part of the plant is but the repetition of a primitive type. Goethe's simple but grand idea was adopted by De Candoille, in his doctrine of a primitive type among plants, from which all departed by the decrease, increase, and adhesion of their organs.

Morphology may be divided into two great divisions—first, that which treats of the forms of plants and their organs in general, and which is only concerned with a few of those ordinary forms which are found common to all plants; and secondly, that which treats of the forms of particular groups of plants and of individual organs. This latter department is by far the most extensive, and is that which contributes so greatly to the just apprehension of the relations which exist between the various groups of plants and their organs. It may be divided into two parts, one of which regards the external form of the plant as resulting from the combination of the various tissues into organs; the other treats of the internal form which the various tissues of the plant assume.

There are certain general principles in morphology which have been everywhere assumed in describing the organs of plants, such as that every plant has an ascending and descending axis; the former called the stem, and the latter the root. These may be traced downwards or upwards through the various series of plants—downwards till we arrive at a point where the cells exhibit no tendency to

either an ascending or descending growth, as in the cells of *Protooccus*; or upwards till the increasing development of the stem exists in the most complicated variety of forms.

The leaf affords the best illustration of the nature of morphological laws. This organ may be regarded as a theoretical point of departure for all other organs which are found upon the stem. In support of this theory we have the fact, that all the organs of the axis may be traced by insensible gradation either to or from the leaf. Thus the bract is often undistinguishable from the leaf, the sepal from the bract, the petals from the sepals, the stamens from the petals, the carpels from the leaves, and the ovules from the leaf-buds. This is the series of gradations which prove the positions of morphology. This phenomenon is frequently observed in cultivated plants, and such changes are called monsters. Most of the double flowers of our gardens are the result of a metamorphosis, in which petals are developed instead of stamens. As an instance of organs which have not assumed the development of leaves, but which yet are formed on the same type and obey the same laws, we may name the stipules and scales of leaf-buds.

The result of these facts is that we may regard the flower as a collection of leaves arranged in whorls, and in fact a branch with a short axis. This idea explains at once those apparently anomalous occurrences where branches grow out of the fruit of the pear or the apple. The apple does but represent the growing point of a branch which, if the circumstances no longer exist which produced the peculiar leaves from which it is formed, will take the ordinary growth of a branch. The admission of these principles has led to the expression of certain laws which regulate the growth of the flowers and fruits of plants, and which, being applied to their peculiarities, are the best means of securing a natural classification. These laws are:—1. That each series of floral envelopes must normally alternate with that which preceded it. 2. That the number of parts in every series must be equal to or a multiple of the number of parts in the first or outer series. The actual departures from this theoretical structure are numerous, but they may be reduced to the simple conditions of the increase, decrease, or adhesion of the various organs, which also obey definite laws.

**MORRIS DANCE.** The origin of this dance is uniformly given to the Moors. The fandango of Spain, danced to the present day, is the old Moorish or Morris dance. It is supposed to have been first brought to England in the time of Edward III., when John of Gaunt returned from Spain; but it was more probably borrowed from the French or Flemings. The hobby-horse, which once performed the principal character in the dance, was a light frame of wicker-work, furnished with a pasteboard head and neck of a horse. This was buckled round a man's waist, and covered with a foot-cloth which reached to the ground and concealed his legs. Thus equipped he exhibited specimens of burlesque horsemanship. Besides the hobby-horse the dancers were—a fool, May or Maid Marian, a friar, a serving-man, a piper, and a few "salvages," wild men or Moriscos. Many antiquaries declare that in one sort of military dance, performed by five men and a boy, the latter wore a round vizorless helmet, a MORRION, and hence was called "mad morrion." This, they say, was the true origin (by folk-etymology) of "Maid Marian."

**MORSE.** See WALRUS.

**MORTALITY, LAW OF, AND TABLES OF.** Uncertain as is the life of any one individual, it is now very well known that if two equal numbers of individuals, at or near the same age, be taken, the number that will be left at the end of a few years will be nearly the same, if they exist during that time under similar circumstances.

The law of mortality, theoretically speaking, is a mathematical relation between the numbers living at different ages; so that, having given a large number of persons alive

at one age, it can be deduced by the law what number shall survive any given number of years; practically speaking, it is, in the absence of such a mathematical law, the exhibition in a table of the numbers surviving at the end of each year.

The obvious and simple mode of forming a table of mortality would be to take a large number of infants born alive, all of the same sex and in the same station of life. If the numbers left alive at the end of every year were noted, until all had become extinct, a column of ages, accompanied by an opposite column noting the number of survivors, would be a table of mortality in the most usual form.

The formation of such a table might require a century of observation. To avoid this, the law of mortality must be assumed stationary; that is, it must be presumed that, out of those who reach, say age seventy, the proportion who die in a year is now what it will be when an infant new-born reaches that age. This being assumed, let the members of a community be counted and their ages registered; at the end of a year it will appear what proportion of each age has died. If the process be repeated in succeeding years, other sets of events are obtained, which may all be put together into one table, when the number has become large enough to secure the observed events representing the average.

Early in the seventeenth century John Graunt of London published his "Natural and Political Observations on the Bills of Mortality," a work which has been called "the earliest movement in economical arithmetic," though about the same period some curious speculations on the subject were published by Sir William Petty. Pascal in France and De Wit in Holland are the next workers of note in the study of the laws of mortality, and in 1693 the celebrated Breslau tables of Dr. Halley were printed in the *Philosophical Transactions*. The work was continued by J. Bernoulli in 1713, and by Dr. Price in 1742, when the latter published his tables of mortality for London. In 1746 M. Deparcieux, in his "Essai sur les Probabilités de la Vie Humaine," in addition to six valuable tables, showed for the first time that women live longer than men. In 1770 Dr. Price published his "Observations on Reversionary Payments," and he afterwards computed the Old Northampton tables from the register of burials in the parish of All Saints, Northampton, for the period 1735-80. The more celebrated Carlisle tables were constructed from observations made at Carlisle by Dr. Heysham, between the years 1780-87. Considering the limited number of observations on which these tables were based, their accuracy is somewhat remarkable, but they have since been superseded by newer tables based upon the combined experience of the largest insurance companies, and by calculations based upon the reports of the registrar-general.

Some valuable tables for the use of the government were calculated by Mr. Finlaison, of which the following is an abstract. It will be seen that of 100,000 boys alive at three, but 94,417 will reach the age of ten, while of girls the number will be 94,551. At fifty the difference is much greater; of females there will then be 65,237 alive, and but 59,123 males. Nine females may reach the age of 100, but none of the other sex.

Age.	Female.	Male.	Age.	Female.	Male.
3	100,000	100,000	55	61,223	53,512
5	97,852	97,723	60	56,458	46,597
10	94,551	94,417	62	54,316	43,493
15	92,387	91,877	65	50,675	39,014
20	88,803	88,506	70	42,209	30,338
25	85,058	82,396	75	32,628	21,266
30	81,331	77,163	80	21,554	13,223
35	77,478	72,446	85	11,971	5,868
40	73,317	67,907	90	5,362	1,170
45	69,238	63,440	95	847	70
50	65,237	59,123	100	9	—

As we have said, however, the greatest light thrown upon the laws of mortality in the United Kingdom is that obtained by the careful carrying out of the Registration Act. It is upwards of forty years since the Act came into force, and the materials which have by its agency been brought into the hands of medical statisticians have given valuable insight into the conditions of life and health. Uncertain as individual human life must always be, we now know that its average duration may be most precisely calculated, that the general and special dangers may be weighed to which each class of our countrymen will be exposed at each age of their existence, and if the numbers taken into account are large enough, a very accurate forecast may be made of the exact fate which is awaiting them.

"Threescore years and ten" is the usual limit of age we have been in the habit of assigning, on high authority, to mankind in general; but, reasoning upon the returns obtained under the Registration Act, the registrar-general fixes 100 years as the natural life-time of man. In other words, if all children were born in perfect health, and were to live afterwards under the most favourable sanitary conditions, 100 years would be the age to which every one of them would attain. But, as a matter of fact, this extreme limit is very rarely reached in the United Kingdom.

From the calculations of Dr. Farr it appears that the average expectation of life calculated in years and hundredths is as follows:—

Age.	Male.	Female.	Age.	Male.	Female.
0	39.91	41.85	55	16.45	17.43
5	49.71	50.33	60	13.53	14.34
10	47.05	47.67	65	10.82	11.51
15	43.18	43.90	70	8.45	9.02
20	39.48	40.29	75	6.49	6.93
25	36.12	37.04	80	4.93	5.26
30	32.76	33.81	85	3.73	3.98
35	29.40	30.59	90	2.84	3.01
40	26.06	27.34	95	2.17	2.29
45	22.76	24.06	100	1.68	1.76
50	19.54	20.75	—	—	—

The average duration of life is thus only 39.91 years for males and 41.85 years for females. Even in the most healthy districts of the kingdom it scarcely amounts to fifty years.

From a still more elaborate table constructed with immense labour by Dr. Farr, we are able to follow the march of a generation through life—that is, the physical fortune any 1,000,000 of our countrymen and countrywomen may expect. The first thing to observe is that their number has been made up of 511,745 boys and of only 488,255 girls, a disproportion which will by and by be redressed by the undue mortality of the boys, and will be reversed before the scene is ended. More than a quarter of the whole will die before they are five years old, or, in exact numbers, 141,887 boys and 121,795 girls. The next five years will be very much less fatal to either sex, the survivors having gone through risks which will never recur. They have probably all suffered from one or more of the many diseases of childhood; and whooping-cough or measles or scarlet fever, which have claimed from them already their thousands and tens of thousands of victims, will have no further terrors for the rest. In the next five years—i.e. from ten to fifteen—the mortality will be still more reduced. This is, indeed, the most healthy period of life, the period of which the death-rate is lowest for both sexes, but lower for boys than for girls. There will be some advance of deaths in the next five years, and still more in the five that follow, but 684,045 may confidently expect to enter on their twenty-sixth year. Before the end of the next ten years two-thirds of the women will have been married. The deaths will be 62,052, of which not less than 27,184 will be caused by consumption. Between the stage of thirty-

five and forty-five on this life-march, a still larger "death-toll" will be paid. In spite of the diminished numbers the deaths will become more frequent, and only a little more than half the original band, or in exact numbers 502,915, will pass on into the next decade of years, from forty-five to fifty-five. Each succeeding decade up to seventy-five will now become more fatal. At the age of fifty-five the new deaths will have been 81,800; at sixty-five they will have been 112,086; at seventy-five, 147,905. The numbers have now shrunk terribly. Only 161,124 still remain to be struck down, and of these 122,559 will have passed away by the eighty-fifth year of the march. The 38,565 that remain, the forlorn hope of well-tried veterans, are now not far from the end. 2153 of them will live to be ninety-five, and 228 to be 100 years old. Finally, in the 108th year of the course the last solitary life will flicker out.

This, then, is the average lot of 1,000,000 persons born in the United Kingdom. There are, of course, some specially favoured districts where the chances of a long life will be much greater, and there are some dark spots where the step of death will be much more rapid. If the rest of England, for instance, were as healthy as Hampstead, the deaths before five years would be reduced by more than 80,000. Each succeeding period would be less fatal than it has been shown actually to be, and there would be nearly double the number of survivors up to eighty-five years.

In spite of all drawbacks, however, the sanitary progress we have already made has been by no means inconsiderable. Two hundred years ago the yearly mortality of London was not less than 8 per cent. A hundred years ago it had been reduced to 5 per cent., and it is now 2·4. The more carefully, too, that we look into the causes of the mortality which exists among us, the more certainly shall we feel convinced that it can be still further reduced. Impure air, impure water, accidents by negligence, and mischief done in a thousand preventible ways, all number their yearly victims. There are, too, no less than fifty-four large tracts of the country where the yearly mortality for each 1000 of the inhabitants is less by five than the average mortality, and less by twelve than the mortality of the most fatal district. The registrar-general considers that the yearly death-rate of the kingdom ought not to be suffered to exceed seventeen per 1000 (instead of twenty-two per 1000), and that all who die in excess of that number must be considered simply as sacrificed to the ignorance or carelessness of society. The evils, moreover, of a high death-rate do not end with the mere loss of life which it implies. It is found by experience that for each annual death there are at least two cases of severe sickness, and that whatever causes influence the one order of events influence the other, too, in the same proportion. A diminution of the year's deaths means, therefore, a better chance of good health to the survivors.

The relative health of men engaged in various occupations is a subject which has long received the attention of medical philosophy. The first place, or a high place among the first, is assigned to our farmers and agricultural labourers, and it is found that in no country are the agricultural classes healthier than they are in England. The mortality of the manufacturing classes was at one time exceptionally high, but of late years there has been a very remarkable and beneficial change, which is largely attributable to the labours of Lord Shaftesbury and his enlightened colleagues. Something, too, must be allowed to the employers of labour, without whose hearty co-operation no Factory Act could be of much service. Among the most healthy occupations are those of the hunter and sportsman. But the higher parts of the brain appear to be little cultivated by those who engage in them. The earthenware manufacture is one of the unhealthiest trades in the country. The average of death is at first low, but after the age of thirty-five it is nearly double that of other

trades. Metal working does not begin to be injurious until ten years later, but from forty-five onwards the mischief it inflicts grows each year heavier and heavier. The trade of coachmaking is similarly a very healthy one at first, but at forty-five it begins to be exceptionally fatal. Hard work and exposure to weather or to the chance of accident are, of course, among the most general causes which make some trades and professions mischievous. But the opposite extremes are scarcely less fatal. Tailors, drapers, hairdressers, and publicans, none of whom have a very hard life, are, nevertheless, to be reckoned among the unhealthy classes. Publicans in particular are found to suffer more from fatal diseases than the members of almost any other known class—a fact ascribed by the registrar-general to their habits of indulgence in repeated small doses of alcoholic poison. Clergymen and barristers appear to be among the most favoured classes, but physicians and surgeons up to forty-five are very much less fortunate.

The fact is that the physical conditions of a sound life are very much the same everywhere, and that those trades and professions will be the healthiest which can most exactly conform to them. Pure air, pure water, good food not taken in excess, regular exercise, which exerts, as far as possible, all the muscles without overstraining any of them, sufficient sleep, protection against the extremes both of heat and cold—these are the chief points to which those must attend who wish to live long and healthily. Some of these are within the reach of all, though few, probably, avail themselves of them as completely as they might. Even so there would still remain many cases in which men were sacrificed by the faults of others, or by the necessarily hard conditions under which they carried on their work. Civilized life has its dangers together with its privileges. It inflicts injuries of which savage man has no knowledge. It claims its myriads of victims whom a less developed state of society would have spared. The remedy for all this is, we may hope, to come. The mere knowledge of the evil is in itself a first and necessary step towards its cure. To improve the health of the present generation is the duty which lies ready to our hands, and our article on SANITARY LEGISLATION shows that its grave importance has not been overlooked by the legislature.

Nor has the subject been at all neglected by eminent members of the medical profession, who are probably the most competent authorities in the matter. The causes of excessive mortality and the best measures for its reduction are generally among the topics of greatest interest at our social science congresses, while experienced and thoroughly practical authorities like Dr. Richardson have not hesitated boldly to point out the chief preventible means by which disease, and consequently high mortality, is induced. These, generally speaking, are—mental and physical strain, singly or in combination; the passions, alcohol, tobacco, narcotics, foods, impurity of air, particular occupations, sloth and idleness, late hours and broken sleep, errors of dress, moral contagion, hypochondriasis, and the intermarriage of diseased persons, as affecting their offspring. This is the black list which is chiefly responsible for the high rates of mortality, and in his work on the "Diseases of Modern Life" (London, 1876), Dr. Richardson very ably points out what must be their inevitable effect upon the individual and upon the nation at large.

According to Siegwart's *Alter des Menschengeschlechts*, the earth is inhabited by 1,381,000,000 human beings. These are divided as follows:—

Caucasian race, . . . . .	880,000,000
Mongolian race, . . . . .	580,000,000
Ethiopian race, . . . . .	200,000,000
Malay race, . . . . .	220,000,000
Redskins, . . . . .	1,000,000

It has been computed that the annual mortality of the

world is over 33,000,000, and the daily mortality over 92,000, or more than one death for every second of time. The average duration of life is about thirty-three years. One-fourth part of the population dies before reaching the seventh year; one-half before reaching the seventeenth.

**MORTAR.** See CEMENTS.

**MORTAR**, a vessel in which substances are either reduced to fragments, pulverized, or dissolved by beating or trituration with a pestle. Mortars are made of cast iron, stone-ware, glass, agate, flint, or porphyry, according to the use to which they are to be applied.

**MORTARS** are pieces of ordnance which, compared with guns, are very short, but have a much larger diameter in their bore, and which are employed to throw shells or carcasses at considerable elevation (generally at 45 degrees), in order that the missile may range to a great distance, and by falling nearly vertically upon the object (a barrack, magazine, or casemate), may crush it by the momentum acquired in descending. Mortars are either of iron or brass; they rest upon solid beds, and the trunnions or cylinders upon which they turn, in giving the required elevation, are placed at the lower extremity of the piece. The calibres of mortar in the British service are  $4\frac{1}{2}$ ,  $5\frac{1}{2}$ , 8, 10, and 13 inches.

With the era of Moncrieff carriages and thirty-five and fifty ton guns, proposals were made for the construction of sea-service mortars to throw enormous shells whose vertical fall would reduce fortresses otherwise inaccessible. Mallet constructed a mortar weighing 52 tons, to fire 86-inch shells of  $1\frac{1}{2}$  ton each. Such mortars, carried on small well-adapted vessels, would have been of incalculable value to Sir Charles Napier before Cronstadt in 1855; but more general faith seems now to be given to elongated shells of immense weight projected from rifled cannon.

It has been supposed that mortars were employed in the year 1495, at the siege of the Castle of Naples, but this is doubtful; in 1588, however, the use of mortars must have been well known, since in the appendix to the "Colloquies" of Tartaglia then published, the method of filling the projecting carcasses is described.

The Dutch engineer Coehorn invented small mortars for throwing grenades into covered ways. They were capable of being carried about and were served by one man; consequently they could be readily brought up to a convenient spot, and fired rapidly when it was intended to drive the defenders from behind the parapets. In the French service *pierriers* (small mortars loaded with stones) were employed for the same purpose. Stones have been occasionally fired from excavations in rocks, and there are several "rock-mortars" at Malta.

**MORTGAGE** (pr. mor'gage), in law, a pledge of land or other real property in security of a loan. The borrower of the money, who grants the estate as security for the debt, is called the *mortgagor*, and the lender, who accepts the security, the *mortgagee*. The whole transaction is properly termed a mortgage, but the name is sometimes applied simply to the debt.

The relationship of the mortgagor and the mortgagee, and their several rights and obligations resulting from their contract, belong to the general doctrine of pawn or pledge; but the nature of property in land in England has modified the general rules as to pledge which are received in all countries where the Roman law has had any influence. In earlier times, in the eye of the common law the mortgagee was the owner of the estate conveyed in the mortgage, his ownership being limited by the condition that upon due payment of the interest and principal he was bound to reconvey the land to the mortgagor. In the event of failure of payment the land belonged absolutely to the mortgagee. As, however, in equity the mortgagor remained the real owner, and the mortgagee was merely an encumbrancer, certain restrictions upon the rights of the latter were

imposed from time to time, and the mortgagor was protected by an *equity of redemption*. By this provision of the law a mortgagee, although he has in the eye of the law become absolute owner of the mortgaged property after breach of the condition for repayment of the loan within the strict time, yet is compelled to reconvey the legal estate to the mortgagor if the latter applies to redeem the mortgage before foreclosure or sale, and makes payment of principal, interest, and costs within twenty years of the last written acknowledgment of his right. When a mortgagor is entitled to redeem he has also the right to direct the mortgagee, instead of reconveying, to assign the mortgage debt and convey the mortgaged property to any third person as the mortgagor may direct, and any person entitled to redeem may have a judgment or order for sale instead of for redemption. A mortgagee may, however, on default of payment file a bill of foreclosure, requiring the mortgagor to pay the amount of the debt, with interest and costs, by an appointed day, or submit to be deprived of his equity of redemption; but the court in any foreclosure suit may, at the request of either side, order a sale instead of a foreclosure. A foreclosure action must be brought within twelve years after the right to bring it first accrued, or within twelve years after the last payment of any part of the principal money or interest.

An *equitable mortgage* is one in which the legal estate does not pass, either because there is no conveyance or because the mortgagor is only equitable owner. A deposit of title-deeds as security for a loan, with or without a written instrument, will constitute an equitable mortgage. Any subsequent legal mortgagee having notice of the deposit will be postponed to the equitable mortgagee, and when the legal mortgagee has not inquired as to the title-deeds, the court will impute to him such knowledge as he would have acquired if he had made the inquiry.

A *statutory mortgage* is where a charge is created, as in the case of shares in a ship, merely by registration without conveyance.

In the law of Scotland the term mortgage has fallen into disuse as a technical term to denote a heritable security, though still popularly employed in that sense. Its earliest form was a *wadset*, in which the principles of the ordinary English mortgage were recognized. Gradually the wadset was superseded by the heritable bond, and the bond and disposition in security, by the latter of which especially the rights of heritable creditors are placed on the most secure basis that can well be invented. [See HERITABLE SECURITIES.] Mortgage is still the term employed for creating securities over ships; and the form and incidents of such deeds are much the same both in Scotland and England, though certain differences may be traced, particularly with reference to the powers of the mortgagee.

**MORTIFICATION**, in medicine, is the death of any tissue. It may occur from a variety of causes, as intense inflammation, or from anything which is followed by a cessation of the circulation of blood through a part, as diseases of the arteries and veins, the pressure of tumours and foreign bodies, excessive debility, &c., or from any sudden and violent chemical or mechanical agent, as strong acids or other corrosive substances, excessive heat or cold, violent blows, &c. The process of reparation consists in the separation of the living tissues from the dead, the removal of the dead tissues by absorption or by being thrown off externally, and the granulation and cicatrization of the exposed surface of the living tissues. See also GANGRENE.

*Mortification*, a Scottish legal term. See MORTMAIN.

**MORTIMER**, one of the great feudal baronial houses of the middle ages in England. The earldom of March was held by this family, and two Mortimers—Roger, the first earl, and Edmund, the grandson of his great-grandson—assume a prominent position in our history.

ROGER MORTIMER, a ward of Piers Gaveston, was born in 1287, and accompanied Edward I., who had just knighted him, in the Scotch campaign of 1306. He rose to great favour under Edward II., became Lieutenant of Ireland for a short time in 1317; but he joined with Lancaster and the other nobles in the great rising against Edward's government through his favourites the Despencers, and when this rising collapsed and Lancaster lost his head, Mortimer also was thrown into prison. He escaped to France in 1323, where he found Queen Isabella of England, who, being a sister of the King of France, had been sent over by Edward to arrange a treaty. Once in France the queen declined to return, for Edward's domestic vices were such as to render him unendurable. His public crimes sent many nobles over to the party of the queen and the infant prince. Mortimer entered into a guilty intrigue with Isabella, and was the soul of the conspiracy. The queen and Mortimer and their party landed at Orwell, September, 1326, determined to attempt the conquest of England. Edward fled to Wales with Despenser, but was captured and sent to Kenilworth Castle, while Despenser was hung on a gallows 50 feet high. Mortimer and the queen summoned a Parliament, which deposed Edward II. and proclaimed the boy-king Edward III. in his stead, January, 1327. Roger Mortimer now became Earl of March, and assumed the entire control of affairs. The former king was assassinated in September of the same year by his orders. He caused great discontent by his peace with Robert Bruce in 1328 at the treaty of Northampton, acknowledging the independence of Scotland. The baronage, long discontented with Mortimer, rose against him. He determined to strike a bold blow, and arresting the king's uncle, the Duke of Kent, hurried him to the block, March, 1329. Edward III., though but a lad of fifteen, could bear no longer his mother's disgrace and the tyranny of his father's murderer, her paramour, and having headed a party which entered Nottingham Castle by a secret passage, he there arrested the Earl of March with his own hand, 19th October, 1330, and assumed the government. The queen was sent into seclusion and Mortimer hung as a traitor at Tyburn, 25th November, 1330. In 1354 the attainder was reversed, and his title and estates restored to his grandson.

EDMUND MORTIMER, Earl of March, and rightful heir to the English throne on the death of Richard II., was the grandson of the great-grandson of Roger, the first earl. Edmund, the great-grandson of this latter, married Philippa of Clarence, daughter of Edward III.'s third son, Lionel, duke of Clarence. Edward's eldest son, the Black Prince, had left issue, Richard, who reigned from 1377 to 1399; his second son died childless; his third son, Lionel, left issue, Philippa; his fourth son was John of Gaunt, father of Henry IV. It is manifest, therefore, that, as Richard II. was childless, Edmund Mortimer's son by the Duchess of Clarence was his heir. This son was Roger, earl of March. He died in 1398, and the heirdom to the crown then passed to his son Edmund, a boy of six. When, therefore, Richard II. was overthrown and deposed by Henry of Lancaster in 1399, the latter rightly chose to rest his claim to the crown upon a parliamentary recognition of his conquest, merely mentioning his descent by both father and mother from HENRY III. (not referring to his rank as grandson of Edward III.), and not claiming definitely to succeed in right of birth. The Lancastrian title was thus a purely parliamentary one.

There were several unsuccessful attempts made in the name of Mortimer to overturn Henry's government, though the young earl himself was kept in a kind of honourable captivity at Windsor; such were the confederacy of the Percys with Glendower in 1403, the conspiracy of Scrope, archbishop of York, and the Earl of Northumberland in 1405, and a rising under Richard, earl of Cambridge, Lord Scrope and Sir Thomas Grey against Henry V. in 1416.

Mortimer himself took no part in them, and when he died it was in the honourable position of lord-lieutenant of Ireland under the regency of the uncles of the boy king, Henry VI.

As for his right to the crown, it prevailed after all in the long run; for his sister married that Earl of Cambridge who paid with his head in 1415 for his attempt to conquer his brother-in-law's rights, and Richard, the earl's son by Anne Mortimer, was therefore the representative of the Mortimer claim on the death of his uncle Edmund in 1424 without issue. Earl Richard, on his father's side, was a descendant of Edward III. through Edmund of Langley, his fifth son; but his mother's claim from the third son of Edward III. was, of course, the true York claim. Richard became Duke of York and the chief man in the kingdom, but flew into civil war when a son was born to his rival, Henry VI., and his chance of a peaceful succession was thus endangered. The Duke of York himself fell in battle at Wakefield Green; but his son Edward won the crown in 1461, and, as Edward IV., reigned over England.

**MORTISE AND TENON**, a peculiar joint in carpentry. The mortise is a deep groove cut into a piece of wood, and the tenon a projection on another piece so cut as exactly to fit into the mortise. The framing of doors, shutters, and strong joiner's work is fitted together with mortise and tenon joints.

**MORTMAIN**. By the 9 Henry III. c. 36 (Magna Carta), it was declared that it should not be lawful for the future for any person to give his land to a religious house so as to take it back again and hold it of the house; and any such gift to a religious house was declared to be void, and the land was forfeited to the lord of the fee. The reason of this provision is obvious if we consider the nature of the feudal tenure; and indeed it is distinctly expressed in the preamble of the statute of the 7 Edw. I., sometimes entitled "De Religiosis," as follows:—"Whereas of late it was provided that religious men should not enter into the fees of any without the license and consent of the chief lords (*capitulum dominorum*) of whom such fees are immediately held; and whereas religious men have entered as well into fees of their own as those of others, by appropriating them to their own use and buying them, and sometimes receiving them of the gifts of others, by which means the services due from such fees, and which were originally provided for the defence of the realm, are unduly withdrawn, and the chief lords lose their escheats of the same," &c. The statute then forbids any religious person or any other to buy or sell lands or tenements, or under colour of a gift or term of years, or any other title whatever, presume to receive from any one, or by any other means, art, or contrivance to appropriate to himself lands or tenements, so that such lands and tenements come into mortmain in any way (*ad manum mortuam deveniant*), under pain and forfeiture of the same. The statute then provides that, if it is violated, the lord of whom the lands are holden may enter within a year; or if he neglect to enter, the next lord may enter within half a year; and if all the chief lords of such fees, being of full age, within the four seas and out of prison, neglect to enter, the king may enter.

The general notion of mortmain may be collected from the words of this statute, the term being used to express lands belonging to any corporate body—ecclesiastical, or sole, or aggregate. Various explanations have been offered as to the reason why lands of this description were said to be in mortmain, or in *mortua manu*—that is, in a dead hand. Under the feudal system lands held by any corporate body or person might not inappropriately be said to be in a dead hand as to the lord of the fee; for as a corporation has a perpetual existence, the lord lost the profits of his lands, which, under the strict system of tenures, he derived either from the services of the tenant while alive,



or from the death of the tenant and other circumstances. Accordingly, the best explanation of the meaning of this term seems to be that offered by Coke, that "the lands were said to come to dead hands as to the lords, for that by alienation in mortmain they lost wholly their escheats, and in effect their knights' services for the defence of the realm—wards, marriages, reliefs, and the like—and therefore was called a dead hand, for that a dead hand yieldeth no service."

Before the 9th Henry III. c. 36 was passed a man might give or sell his lands to religious as well as any other persons, unless it was forbidden in the gift of the lands to himself; and accordingly the great lords, on making a grant of land, used to insert a clause preventing the sale or gift to religious persons and also to Jews. Numerous statutes were subsequently enacted to prevent the alienation of land in mortmain, as 15 Richard II. c. 5.

The statute of the 9 Geo. II. c. 36 is now commonly, though not correctly, called the Statute of Mortmain. It applies only to England and Wales. It is entitled, An Act to restrain the Disposition of Lands, whereby the same become inalienable. The object of this Act was to prevent languishing and dying persons being induced by undue influence to make over or bequeath their lands to ecclesiastical, religious, or charitable corporations. It accordingly provided that neither lands, money, stock, or other personal estate, to be laid out in the purchase of lands, could be settled or conveyed for any charitable uses except by deed executed twelve months at least before the death of the donor, and enrolled in Chancery six months next after the execution thereof; nor unless such stock should be transferred six months at least before the death of the donor; nor unless the deed be without any power of revocation, trust, &c., for the benefit of the donor or any person claiming under him; and all gifts, conveyances, and settlements for any charitable uses whatsoever, made in any other manner or form than by that Act is directed, were declared to be absolutely null and void.

This Act only applied to land in England, and the Universities of Oxford and Cambridge, and the colleges of Eton, Winchester, and Westminster, were excepted from its influence. Since it was passed some important exceptions and modifications have been made on behalf of the Established Church, of charity schools, of places for religious worship, burial places, &c. The 58 Geo. III. c. 45, amended by 59 Geo. III. c. 134, and 2 & 3 Will. IV. c. 61, were designed to promote the building of new churches in populous places in England and Wales. The 4 & 5 Vict. c. 38, amended by several subsequent statutes, afforded facilities for the conveyance and endowment of sites for schools, and more recent measures, such as the 34 and 35 Vict. c. 13 and the 36 & 37 Vict. c. 50, have made important exemptions from the statutes of mortmain in favour of gifts and bequests of land for public parks, schools, museums, &c.

The term *mortification* in Scotland expresses pretty nearly what mortmain does in England. As one of the feudal holdings mortification was abolished at the Reformation, the Act 1587, c. 29, declaring that all lands held by the church for religious purposes should thenceforth belong to the crown. Lands, however, may still be mortified for charitable purposes by being disposed to trustees for behoof of the superior, and held by them either in bench or feu of the charity, as in the ordinary case. By Act 1633, c. 36, it is declared unlawful to alter the purpose of any mortification from that prescribed by the donor. The management of the trustees of hospitals and mortifications is subject to the control of the Court of Session. And that court, though it cannot change the object of a charity, may vary the modes of attaining that object when circumstances render its intervention necessary or expedient.

**MORTON, CARDINAL**, was born at Bere, Dorsetshire, in 1410. He studied at Balliol College, Oxford, became LL.D. and vice-chancellor of the university in 1446. He received much church preferment, and practised as an advocate in the Court of Arches, where he acquired the notice of Cardinal Bourchier, who introduced him to King Henry VI. He adhered to this unfortunate prince with so much fidelity that even his successor Edward IV. could appreciate so unusual a virtue. In 1472 he made him master of the rolls, and in 1479 bishop of Ely and lord chancellor of England, and at his death appointed him one of his executors. It is Bishop John Morton of whom Richard speaks—

"My Lord of Ely, when I was last in Holborn  
I saw good strawberries in your garden there."  
—Richard III., iii. 4.

Richard threw the virtuous chancellor into prison, but he escaped to Flanders and worked powerfully for Henry of Richmond's interest. Morton is said to have been the person who first proposed the coalition of the two houses of York and Lancaster by the marriage of Henry of Richmond with the eldest daughter of Edward IV. As soon as Henry VII. was seated on the throne he made Morton his lord chancellor, and in 1486 promoted him to the archbishopric of Canterbury. In 1498 he was created a cardinal by Pope Alexander VI. He had previously obtained a bull permitting him to exercise authority over the monasteries, which had become very dissolute. About this time also he received Sir Thomas More into his household, and a vivid picture of the aged statesman and the liberal man of culture is given in More's "Utopia." He died 15th September, 1500.

**MORTON, JAMES DOUGLAS**, fourth Earl of, and Regent of Scotland, was a younger son of the great family of Angus. Morton was the second son of Sir George Douglas of Pittendreich. He married Lady Elizabeth Douglas, daughter of the third Earl of Morton by a natural daughter of King James V.; and on that occasion the earl, having no male issue, obtained a new reversionary clause to his patent, transferring the earldom to his son-in-law. In consequence of this provision he was styled the Master of Morton; and in 1558 he became Earl of Morton. Up to this time he, like his father, was a promoter of the Reformation and a friend of King Henry VIII. On 7th January, 1563, he was constituted lord high chancellor of Scotland. He was obliged to lay down this office and fly into England on the occasion of Rizzio's murder, in which affair he took a prominent part. He remained in England till the end of the year, when he was restored to Mary's favour by the intercession of Bothwell, who soon opened to him the plot for the murder of Darnley, in which Morton refused to concur. But he neither informed Darnley of the design, nor took measures to prevent its being executed; and he subscribed the bond to protect Bothwell against the charge of being concerned in the murder, and to promote his marriage with the queen. Yet when this event took place Morton was the great leader in opposition to him. When Mary was imprisoned the Earl of Murray was made regent and Morton reinstated in the office of lord chancellor. He continued in this situation during the regencies of Murray, Lennox, and Mar; and on Mar's death Morton was himself appointed regent of the kingdom. Finding himself becoming odious to the nation, he conceived the idea of retrieving his reputation by offering to resign the government to the king (James VI.), then in his twelfth year. On 12th September, 1577, he resigned his office to King James VI., who by the advice of Athol and Argyll accepted it, to the great joy of the people. Morton retired to Lochleven, until an opportunity presented itself to become master both of Stirling Castle and of the king's person. He then, by the help of Queen Elizabeth, retained power for some time, until the king's favourite, Cap-



tain Stewart, charged him with being accessory to the murder of Darnley. Upon this charge Morton was arrested. Elizabeth used every endeavour in favour of Morton; but he was, on 1st June, 1581, brought to trial in Edinburgh, found guilty, and condemned. When that part of the verdict was read which found that he was accessory to the murder he exclaimed, "God knows it is not so." He was beheaded on 3rd June, 1581.

**MOSAIC** (*Opus Musivum*). The derivation is not, of course, from Moses, but from the Muses (Gr. *mousai*), "monsaic" work being artistic pavementary work. It was, and is, a species of inlaid or tessellated work, made with minute pieces of coloured substances, generally either marble or other coloured stones, or else glass more or less opaque, and of every variety of hue which the subject may require. The former mode was that chiefly employed by the Romans for their costly tessellated pavements, many of which have at various times been discovered in England. It was applied by them in four different styles: the *opus tessellatum*, the *opus vermiculatum*, the *opus sectile* (these three being purely geometric patterns, in black, white, and red), and the *opus musivum* (or pictorial, in which natural objects were imitated). Examples of pavement mosaics in each of these have been discovered at Pompeii. One of the finest specimens of ancient mosaic is the celebrated pavement, representing a *fête* at the inundation of the Nile, preserved in the Barberini Palace at Palestrina. Mosaic continued to be used both for pavements and ornamenting walls to a late period in the middle ages, and was greatly practised in Byzantine buildings, and by Byzantine artists who were also employed in Italy.

There is a species of mosaic of comparatively modern invention, made of a kind of gypsum or talc, which is calcined in a kiln, beaten in a mortar, and sifted. From this material artificial marbles are formed, which are made to imitate precious stones; and from these a mosaic work is composed which is little inferior in lustre and durability to the natural stones. Something akin to mosaic or coloured inlaid-work, but made up of pieces of far greater size, was occasionally employed in Italy during the middle ages for external decoration; as an instance of which the façade of the Duomo at Pisa and Giotto's unrivalled Campanile at Florence, &c., may be mentioned; here, though the pattern is chiefly in black and white, brilliant reds and blues are intermixed at intervals.

Although nearly similar as to their process, mosaic pictures, especially some of those of later times, may be considered as a distinct branch of the art. Whether actually employed as pavements or inserted in walls, mosaics of this class consist chiefly of ornament and pattern, executed in few and simple colours, with hardly any attempt at variety of tints and due gradation of tones, even in the figures, human or animal, occasionally introduced in them. Such a simple design forms the subject of our Plate. It is a faithful representation of an early British work of about the fourth century, under the Roman occupation, and was found in 1818 at East Coker, near Yeovil, in Somerset (a famous place for Roman "finds"), with other pavement mosaics of geometrical pattern. The whole discovery, including hypocausts for baths, tiles, tesserae, Roman coins, &c., occupied one field—the Chesil field—of the Helyar family of Coker Court. The mosaic of our illustration was carefully removed to the great hall of the mansion, placed in a frame, and preserved with a care commensurate with its great value and interest. It was ultimately presented by the family to the museum of the Somersetshire Archaeological Society for its better preservation. Its execution, though archaic, is spirited, and tells its story well. Two hunters returning from the chase bear the deer they have killed suspended from a pole resting on their shoulders, and their dog looks up at them. A herring-bone border, only a small part of which now remains, once

surrounded the picture, which ornamented the floor of the *triclinium* or dining-room. A careful water-colour drawing of this valuable work of undoubted authenticity is in the collection which Dr. Wollaston presented to the nation, and which is now in one of the chief courts of the South Kensington Museum, and the present Plate is a reproduction of Dr. Wollaston's drawing. It should be noticed how the fragments of stone rapidly decrease in size as the critical parts of the drawing are reached, so as to allow a large freedom in expressing contours and colours. The mosaic measures about 4 feet 6 inches square. The groundwork is of white lias.

For a long period after the decline of the arts mosaic pictures continued to be employed in Italy, both externally and internally, for the decoration of churches, as, for instance, on the façade as well as within the basilica of St. Mark's at Venice. St. Paul's, at Rome, is decorated with portraits of all the popes, from St. Peter himself, in mosaic manufactured at the celebrated studio in the Vatican. The number of enamels of different tints preserved for the purposes of the works at St. Peter's and elsewhere, amounts to no less than 10,000. Each portrait executed in the series already mentioned occupies the entire labour of the artist for twelve months.

The mosaic work so much admired in St. Peter's at Rome, and in London at South Kensington Museum and at St. Paul's Cathedral, &c., is executed with an opaque kind of coloured glass. The small pieces (technically called *smalts*) of this material are arranged so accurately, and light and shade are so well observed, that they appear as smooth as marble, and as highly finished as a painting in fresco, with this advantage that the glass retains its lustre for ever, while mere paintings soon lose their brilliancy. Some splendid effects are produced by gilding the *smalts* and glazing over the gold. Many of the ancient Byzantine mosaics have these gold backgrounds, which are imitated in the best modern work. The pieces of glass are laid on a kind of plaster, composed of lime, fine brick-dust, gum-tragacanth, white of eggs, and other ingredients.

Copies of celebrated works by Raphael and other masters have been executed in fine mosaic, and at a little distance have the effect of paintings produced in the usual way, though at infinitely greater cost. Similar mosaic is employed sometimes on a miniature scale for pictures on the lids of snuff-boxes and articles of that kind, which are at the best mere curiosities and very laborious trifles. Florentine work may also be mentioned as a species of mosaic, chiefly used for inlaying or veneering marble slabs for tables, and decorative purposes of that sort upon a moderate scale. In this leaves, petals, stems, &c., are cut out of marble or stone of suitable colour and natural shading, and let into the groundwork—a slab usually of black marble; and the whole is then polished to a surface. A beautiful effect is produced by letting in transparent stones or fragments of enamel among the rest, say carbuncles, to represent the cherries in a bunch of fruit and leaves, &c. If at all elaborate the work is very costly. One fine table costs several thousand pounds. Our own Tunbridge ware is a species of mosaic, rods of various kinds of wood being arranged in ornamental patterns, and the whole pattern then sliced across into many thin veneers.

The manufacture of the highly decorative mosaic pavement of the mediæval period has been revived in this country, the material used being chiefly the fine clays of the Shropshire coal-field, and among the earliest works of any importance were the beautiful specimens exhibited in the International Exhibition, 1862.

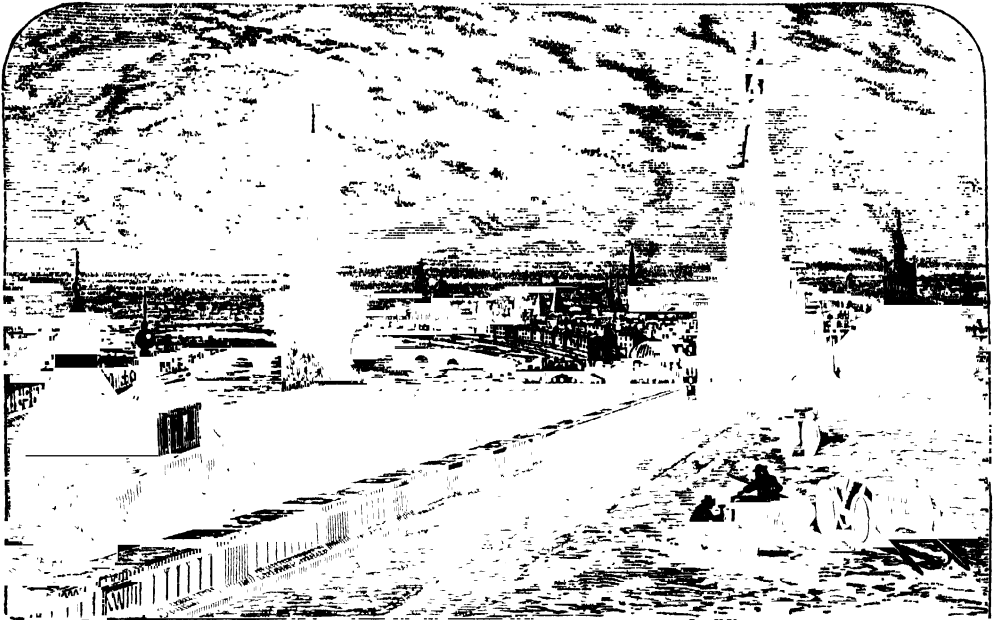
**MOSASAURUS** is a genus of gigantic fossil lizards, most nearly allied to the recent *MONITRUS*. These lizards seem to have attained an enormous size, the length of *Mosasaurus princeps* being reckoned at not less than 75 feet. *Mosasaurus*, like the living *amblyrhynchus* of

the Galapagos Islands, was marine and aquatic in its habits. The body was elongated; the tail was flattened on each side, and formed a powerful swimming organ. The limbs were not like those of the modern lizards, but were rather paddle-like, as those of the ichthyosaurus, but having the digits distinct. The teeth are without true roots, not hollow as in the crocodile, but solid throughout, and joined to the sockets by a broad bony basis, the result of the hardening of the pulp from which the teeth were formed, and likewise attached to the jaw by the ossification of the pulp that had furnished the enamel. The skin of the body was probably protected by bony plates. Mosasaurus and its allies are only known from the cretaceous rocks, being especially abundant in North America.

**MOSCOW** (in Russian *Moskva*, pronounced *Moskva*) was founded in 1147 by the Grand-duke Yuri II., surnamed Dolgoruki or Long-hand. From the middle of the fourteenth till the beginning of the nineteenth century it was considered the capital of Russia. It was sacked by the Mongols in 1233 and 1293, by the Tartars in 1381,

and taken by the Poles in 1611. In 1703 Peter the Great transferred his residence to St. Petersburg, but Moscow was still regarded as the capital of the empire. It was occupied by the French in 1812, when, after the battle of Borodino, the Russian general set it on fire, and compelled his enemies to commence their disastrous retreat.

Moscow is situated 403 miles from St. Petersburg, in a fertile and richly-cultivated country on the banks of the river Moskva, and of the rivulets Yausa and Neglinna. The form of the city is a sort of irregular rhomboid, and its circumference is about 26 English miles. In this space, however, there are above 1000 gardens, besides about 240 kitchen-gardens, some of them of great extent, and a number of fields or parks called Poles, which are uninclosed fields used for promenades, for holding festivals, and for exercising troops; there are likewise 253 ponds or small lakes, on the banks of some of which there are public walks and fine gardens laid out with much taste, but its streets are very uneven and steep. The population of the city is steadily increasing, and in 1882 the number of



Moscow

inhabitants was 751,812, of whom nine-tenths belonged to the national Greek Church. Moscow is built at an elevation of nearly 500 feet, and the mean temperature of the year is 40°, in winter 15°, and in summer 64° Fahr.

As seen from a distance, the city is very beautiful. It has 600 towers belonging to its churches, and these towers being gaily painted present a lively scene. They are mostly situated in open squares, and so escaped the devastating fire of 1812. The roofs of the houses are made of iron plates, painted dark green. Many of the cupolas of the towers are gilt. The city contains eight cathedrals, twenty-one monasteries, about 300 Greek churches, and a few places of worship for Roman Catholics, Protestants, Armenians, and Turks. Since 1812 Moscow generally has been rebuilt, but it is still mostly of wood and irregularly laid out.

It is divided into—(1) The central part, containing the Kremlin; (2) the Kitai-Gorod, or Chinese Town; (3) the Beloi-Gorod, or White Town, surrounding the central part; (4) the Zemlianoi-Gorod, or Earthen Town, so called from the earthen ramparts with which it was formerly surrounded; (5) the Slobodi, or suburbs.

(1) The *Kremlin*, or *Kreml* (a citadel), first built of stone in 1325, in a commanding situation on the banks of the Moskva, is a singular, beautiful, and magnificent object. It is surrounded with walls from 12 to 16 feet thick, and from 28 to 50 feet high, having battlements, embrasures, numerous towers, and five gates. The principal edifices within the Kremlin are—the ancient palace where the czars were crowned and buried; the senate-house, a magnificent structure; and the new palace, completed in 1850, ornamented with the finest statuary and sculpture; the tower of Ivan Velike; the orphan hospital;

the treasury; some palaces, &c. The Cathedral of the Assumption of the Virgin, founded in 1326, is esteemed the most splendid in Moscow. It is crowded with an incredible number of images, pictures, and relics. The Russian sovereigns are here crowned and anointed. The Cathedral of St. Michael contains the tombs of nearly all the Russian czars and royal personages down to the time of Peter the Great, who removed the imperial burying-place to St. Petersburg. The Cathedral of the Annunciation is smaller than the preceding, but built in better taste, and being splendidly ornamented, is a pleasing and magnificent object, forming as it were a wing to the palace. The Cathedral of the Transfiguration is a very plain and nearly square edifice, founded in 1328, and rebuilt in 1527. The great votive cathedral, erected on an eminence facing the Kremlin in commemoration of the signal victories of 1812, is a stupendous edifice, all gold and marble, finished after forty-two years of labour. The style is ancient Russian, or rather Græco-Byzantine, and the interior is very beautiful, though the same cannot be said of the exterior. Including the cathedrals, there are thirty-two churches in the Kremlin. After the cathedrals the tower of Ivan Velike claims attention for its size and magnificent appearance. This tower is 269 feet high from the bottom to the top of the cross. Besides many others, there is in this belfry the great bell of Moscow, the largest ever cast in Europe, being 21 feet high, 20 feet in diameter, and weighing 193 tons 2 cwt. and 1 lb. For a long time it was buried in the soil, but was raised and placed on a pedestal in 1836. The Kremlin contains likewise the imperial museum, the arsenal, and the palace of the patriarch. The arsenal is surrounded by about 1200 pieces of artillery taken from the French, and contains an immense hall for exercising the troops in wet weather. The Emperor Nicolas built a magnificent church for all Russia, and made great improvements in the ancient palace of the czars.

(2) The *Kittu-Gorod* is properly the city. The houses, which are mostly of stone or brick, are built close to each other, contrary to the usual mode. It is the centre of the trade of Moscow, and contains the bazaars, the magazines, and the richest shops. The chief public building is the Pokrovski Cathedral, built in 1554, which was originally so constructed as to include also nine separate churches or chapels, to which eleven more have since been added, so that there are now twenty-one places of worship joined together, in which divine service may be performed at the same time. Among the other public buildings are the town-hall and the printing-office of the holy synod.

(3) The *Beloi-Gorod*, or White Town, contains, besides many fine palaces of the nobility, several remarkable edifices, such as the university, the medico-chirurgical academy, the founding hospital, the post-office, college of foreign affairs, the residence of the governor-general, the assembly-rooms of the nobility, several monasteries and nunneries, and numerous churches. The university, founded in 1755, has an average attendance of 2400 students, and a library of 200,000 volumes. There are also an observatory, museums of natural history, a botanic garden, and numerous scientific and literary institutions in the city.

(4) The *Zemlianoi-Gorod*, or Earthen Town, was erected in 1618. In its place there are promenades planted with trees. In this division are the depot of the commissariat, the depot for spirits (a government warehouse), the Imperial Philanthropic Society, and the Moscow Commercial School.

(5) The *Slobodi*, or suburbs, thirty-five in number, form an immense irregular polygon, completely surrounding the Zemlianoi-Gorod. Part of the suburbs consist of stone and wooden houses, intermixed with superb mansions and mean hovels; but many of them are like villages, with uninclosed pastures, corn-fields, and waste lands. Among these suburbs are to be found Catherine's Barracks, the

military hospital, Galatzin's Hospital, Sheremetof's Hospital, and many very large monasteries, some of which contain three or four churches.

Moscow is the seat of a metropolitan, one of the three highest dignitaries of the Russian Church, and is the residence of the wealthiest and most ancient Russian noble families, especially in the winter; it is the seat of a section of the senate, of a military governor-general, and of a regency or council of administration. The city is supplied with water by means of an aqueduct 9 miles in length. It contains the most important manufactures of the empire, comprising cottons, woollens, and silks—in which steam machinery is employed—carpets, jewelry, and trinkets. From its central situation, and its communication by water with all the principal cities and ports of Russia, its trade is immense; it is, in fact, the centre of the whole internal commerce, and is the depository of large quantities of merchandise of every description. There are lines of railway to St. Petersburg, Nijni-Novgorod, and Odessa.

**MOSELLE**, an affluent of the Rhine, rising in the south-eastern angle of the department of Vosges, France, which, running nearly north-west, passes Remiremont, Epinal, and Charms. A few miles below this last town it enters the department of Meurthe-et-Moselle, which it traverses in the same direction as far as Toul, whence it flows north-east to its junction with the Meurthe, about 8 miles north of Nancy; from this point its course is nearly due north past Pont-à-Mousson, below which it enters Lothringen, where it passes Metz, Thionville, and Sierck. For above 20 miles it forms the boundary between Rhenish Prussia and the duchy of Luxembourg, then taking a decided north-eastern course through Rhenish Prussia, it passes Treves, and after many windings enters the Rhine at Coblenz. The Moselle has a length of 320 miles; it is available for floating timber almost from its source to its junction with the Meurthe, whence to its mouth, a distance of 210 miles, it is navigable. Steamers ply up and down the stream between Metz, Treves, and Coblenz; the up navigation is very tedious, owing to the rapidity of the current. The basin is very narrow, and is subject to inundations, which sometimes cause great ravages. The principal feeders of the Moselle on the right bank are—the Valogne, the Meurthe, the Scille, and the Sarre; on the left bank the Madon, the Math, the Orne, the Sure, the Kyll, and the Elz.

**MOSELLE**, until the war of 1870-71, was the name of a department of France. The largest part of it was annexed to Germany, and the remainder merged in the department of MEURTHE-ET-MOSELLE.

**MOSES** (Heb. *Mosheh*, drawn; Coptic *Mo-ushe*, drawn out of the water), the lawgiver of the Hebrew people, and in a certain sense the founder of their religion, was a member of the tribe of Levi, and the son of Amram and Jochebed. At the period of his birth the Israelites, originally a nomad race, had been dwelling for several generations on the borders of Egypt under the protection of the Pharaohs. This protection, at first given freely and without interference with their own peculiar habits, had, however, been gradually superseded by tyrannical demands for forced labour, followed up by certain measures of savage cruelty, designed to keep them weak and prevent their being a menace to the empire. The family of Amram and Jochebed consisted altogether of Moses, Aaron, and a daughter Miriam, but Moses, owing to the circumstances recorded Exod. ii. 1-10, was adopted and brought up by a daughter of the reigning Pharaoh. The book of Exodus is silent as to the circumstances of his early life, but the Hebrew traditions on the subject are summarized in Acts vii. 22, where it is said "Moses was instructed in all the wisdom of the Egyptians; and he was mighty in his words and works." In the next verse also we read that the

period of the life of Moses during which he was recognized as the adopted son of the Egyptian princess was forty years. The more extended traditions preserved by Philo, Josephus, and others, declare that Pharaoh's daughter was named Thermuthis or Meris, and that she gave Moses such a princely education that he became famous for his learning and wisdom. Employed in the service of the state, he led a victorious expedition to Ethiopia, the queen of which, Tharbis, attracted by the fame of his wondrous beauty, surrendered her capital to him on condition that he took her to wife. Concerning all this the Bible is silent, and after the account of his birth nothing is said until the time of his interference on behalf of one of his enslaved brethren, recorded Exod. ii. 11, 12. Compelled to seek safety by flight he crossed into Midian, a district in or near the peninsula of Sinai, where by an opportune defence of the daughters of the Kenite priest Jethro, called also Reuel or Raguel, he was enabled to find shelter and refuge. Marrying one of the daughters of the Kenite, Zipporah, "a Cushite woman" (Num. xii. 1), he had two sons born to him, and for a long time followed the occupation of a shepherd. The duration of this period is not given in the Old Testament, but in Acts vii. 30 it is stated at forty years. In this seclusion his character ripened and developed, patience and strength taking the place of the rashness and impetuosity of earlier days, and when at the end of the period he received the divine call to return to his countrymen, he displayed wisdom and self-control, as well as unbending determination and courage. His difficulties with his debased polytheistic fellow-countrymen, and his struggle with the Pharaoh, are given in Exod. v.-xii., and there is a remarkable likeness between the plagues inflicted upon Egypt and the natural phenomena of that country. After the tenth plague, which involved the death of the firstborn, the obstinacy of the Egyptian ruler gave way, and the Israelites moved away from their stations in and near that country into the wilderness. Up to this point Aaron is associated with Moses almost on terms of equality, but from the setting out of the Israelites up to the end of his career Moses remains pre-eminently the leader of the people, and his history henceforth is the history of the nation. The records of his teachings, decisions, legislation, and conquests, are recorded in the Pentateuch, and the forty years which the Israelites spent in the wilderness under his guidance mark not only an epoch in their history, but also in the religious history of the world. The coincidences between the arrangements of the priesthood, the dress, the sacrifices, the ark, and the ritual of Egypt, have been pointed out by modern scholars; but the declaration of the unity of God in the Decalogue implies a direct antagonism to the polytheism of that country, and his independence is further shown in the entire absence of any reference to a future life in the Pentateuch, though the doctrine concerning this was strongly developed among the Egyptians. During the closing years of the wilderness sojourn, we find Moses no less celebrated as a conqueror, the victories by which he wrested Northern Moab from the Amorites, though only briefly referred to, being of a most important character. He had now come to the end of his career, for on account of a transgression, the nature of which is somewhat obscure, he had been forbidden to enter the land of Canaan. Appointing Joshua ben Nun his military successor, and intrusting the religious leadership and the Torah to the priests, he ascended one of the peaks of the Pisgah, and after surveying the land from that point "died there in the land of Moab, according to the word of Jehovah," and "he was buried in a ravine in the land of Moab before Beth-peor; but no man knoweth of his sepulchre unto this day."

During the present generation criticism has been busy with the Pentateuch, and many questions have been raised concerning its authorship, history, and the origin of the

legislation it contains. The controversy is yet far from being settled, though it may be regarded as already proved that the traditional conception of Moses and the Mosaic legislation will have to be considerably modified. But even when the most daring criticism is applied to the sacred narrative, it still leaves the great lawgiver one of the grandest heroes and leaders of the past, while the importance of the work he accomplished is amply displayed in the subsequent history of his race.

See also the articles under PENTATEUCH, DECALOGUE, JEWS, GENESIS, EXODUS, &c.

**MOSHEIM, JOHANN LORENZ VON**, an eminent ecclesiastical historian, and a fervid and eloquent pulpit orator, was born of a good family at Lübeck, 9th October, 1694. Having passed through the gymnasium at Lübeck, he studied at the University of Kiel. Here while a young man he was appointed professor of philosophy, and in 1723 he was called to the theological chair at Helmstadt. He assisted in the formation of the new University of Göttingen, and in 1747 he was made its professor of theology and chancellor. He died at Göttingen, 9th September, 1755. He was a voluminous writer, the whole number of his works being 161. The best known is his "Institutionum Historiæ Ecclesiasticæ antiquioris et recentioris," first published in 1726, and again in an enlarged and amended shape in the year of the author's death. This work extends from the birth of Christ to the beginning of the eighteenth century, is an excellent compendium of church history written from the standpoint of liberal orthodoxy. It was translated into English by MacLaine in 1764, and a far superior translation by Murdoch was published in 1832.

**MOSQUE**, a name derived through the Italian *moschea* from the Arabic *mesjid*, a place of prayer, and given to the Moslem places of worship. Wherever the Moslem faith has prevailed, from Spain to India, examples of these buildings exist, and many of them are magnificent specimens of architecture. They vary considerably in style in different countries, for the Arabs, who had no architectural ideas of their own, were largely influenced by the style of building they found in the countries they conquered. [See MOHAMMEDAN ARCHITECTURE and MOORISH ARCHITECTURE.] The earliest mosques, owing to the almost complete absence of ritual in the Moslem worship, are among the simplest of the religious buildings of the world. Of the majority of these buildings the distinctive marks are the cupolas and the minarets. From the upper gallery of the latter the muezzin announces to all true believers the times for prayer—five times daily and twice at night. For this office blind men are often chosen, in order that the neighbouring houses may not be overlooked. Internally the mosque exhibits nothing remarkable as to plan or accommodation, forming merely a single large hall or apartment, without any seats or fittings-up, paved and carpeted, and ornamented with arabesques and mosaics on the walls. In the south-east stands a pulpit (*minbar*) for the chief *imam* (who is called the *Khatib* in Arabia and Egypt), and in front of this there is a raised platform (the *dakka*), from which the Kuran is read to the people. In the direction in which Mecca lies there is a niche towards which the faithful are required to look when they pray. The chief officer of the mosque is the Nazir, who administers its property and appoints the imams and other officials, such as doorkeepers, sweepers, lamp-trimmers, &c., the number of which varies according to the size and endowment of the building.

**MOSQUITO.** See GNAT.

**MOSQUITO COAST.** This country extends along the coast of the Caribbean Sea, from Cape Camaron to the mouth of the San Juan de Nicaragua. The most northern portion of the coast-line is high. The country is at first a level plain, slightly elevated above the sea, but on proceeding further inland it rises in terraces, and the plain is frequently interrupted by depressions and by elevated tracts

which are connected with the mountain ranges. The lower portions are savannas, without trees and frequently without bushes; but where the country rises and forms hills it is well wooded. In the vicinity of the sea the soil is light. The chief rivers are the Blewfields River, which falls into the lagoon of the same name ( $12^{\circ}$  N. lat.), and is said to run upwards of 90 miles, rising within the state of Nicaragua; the Wanks or Segovia River, also rising in Nicaragua, where it passes near the town of Matagalpa and Segovia, with a course of about 250 miles, to the Bay of Cape Gracias a Dios; and the San Juan, issuing from the Lake of Nicaragua. At its mouth is Grey Town, the seat of government. The lagoons are a peculiar feature of this country. Near their entrance the water is brackish, but in the interior it is quite sweet. The climate somewhat resembles that of Jamaica. In the coldest months (from September to February) the temperature varies between  $66^{\circ}$  and  $70^{\circ}$ , but descends occasionally to  $62^{\circ}$ , and even to  $60^{\circ}$ . In summer the thermometer ranges between  $75^{\circ}$  and  $84^{\circ}$ , sometimes rising to  $86^{\circ}$ .

The first settlement of Englishmen on this coast dates from 1730, when some families settled at Cape Gracias a Dios on Black River and at the mouth of Blewfields River. In 1813, when the States of Central America acquired their independence, that of Nicaragua claimed the Mosquito Coast as a portion of its territories, but these claims were rejected by England and the King of the Mosquitos. The Mosquito Coast, prior to 1859, was under the protectorate of Great Britain. It now forms the eastern portion of the State of Nicaragua, having been made over by Honduras in 1860. The chief products are cacao, cotton, sugar, indigo, vanilla, and logwood. Mahogany, which grows luxuriantly in the warm damp climate of the shore, forms the principal export.

**MOSS TROOPER.** The usual appellation given to the marauders upon the borders of England and Scotland, previous to the union of the crowns. They were so named because they dwelt in the mosses.

**MOSSSEL BAY,** a county in the south-west province of Cape Colony. It lies on the coast between George and Swellendam, and is partially agricultural and partly pastoral. The crops are wheat, barley, and oats; and there are large stocks of cattle, sheep, goats, and ostriches. The forests produce fine timber. The port of Mossel Bay has a good harbour, with lighthouse, jetties, and warehouses and a considerable trade. The area is 761 square miles.

**MOSESSES** (Musci) are a group of tiny plants belonging to the CRYPTOGAMIA or "flowerless plants." They grow all over the world, even on the tops of mountains where no flowering plant can live. A few species have been found in amber. The spores (microscopic reproductive bodies) produce at first a number of delicate threads (*protonema*), from which bud forth the complete moss with stem and leaf. The *protonema* is sometimes a felt-like mass extending over one or several square inches, and though it generally dies away when the moss-plant is produced, it occasionally, in the case of short-lived mosses like *Pottia*, continues to flourish until the spore-case has been formed. The leaf-bearing plant springs from the lower cells of the lateral branches of the *protonema*. In mosses there is no true root, but its place is taken by root-hairs, prolongation from cells in the lower part of the stem. Antheridia and archegonia appear at the ends of the stem or branches, either together or even on different plants; they are surrounded by leaves of special form, and are mixed with club-shaped bodies called paraphyses. From the antheridia the antherozoids escape, and fertilize the oosphere, the central cell of the archegonium. The fertilized oosphere becomes the sporogonium, which consists of a stalk (the seta) and a spore-case (the theca or urn). As the sporogonium grows it generally tears away a portion of the tissue above it and carries it, up as a hood (the calyptra). The

spore-case has a wall of several cells in thickness; there is an axis of tissue which remains after the surrounding cells have been formed into spores; this axial tissue is called the columella.

Mosses are divided into four orders:—(1) *Sphagnaceæ*; (2) *Andreaeaceæ*; (3) *Phascaceæ*; (4) *Bryaceæ*.

The *Sphagnaceæ* contain only a single genus, *Sphagnum* (Plate Mosses, fig. 1). Several of the cells of the leaves and stem lose their protoplasm, holes are formed in them, and they become filled with water; they "serve as a capillary apparatus for the plant, through which the water of the bogs in which it grows is raised up and carried to the upper parts; hence it results that the *Sphagna*, which always grow erect, are penetrated with water to their very summits like a sponge, even when their tufts stand high above the surface of the water." The sporogonium contained within the calyptra is raised above the leaves by the growth of the summit of the branch. The calyptra is not carried up as in most mosses, but at length bursts irregularly, and the spores escape after the detachment of the lid. In fig. 1a there is figured a ripe spore-case (or urn), with the lid at the top and the remains of the calyptra below. The stalk is the elongated branch, and not the seta, which is not developed in *Sphagnum*.

The *Andreaeaceæ* are small leafy mosses. The spore-case (or urn) has no lid, but allows the spores to escape by means of four lateral slits, which close in wet, but open in dry weather. The seta is very short, and the urn is raised above the plant by the same means as in *Sphagnaceæ*. The calyptra is torn away at the base from the surrounding tissue by the lengthening of the urn, and thus becomes a pointed cap.

The *Phascaceæ* are also very small mosses. The urn has neither lid nor lateral slits, and the spores disperse only when the urn decays. See figure of *Phasum*, Plate, fig. 2, which is the natural size; a is the same enlarged; b is the urn with the calyptra detached.

The *Bryaceæ*, to which class most mosses belong, have a well-developed seta; the urn opens by means of a lid (operculum). When the operculum falls off, the mouth of the urn is in most cases seen to be provided with a row of appendages, called teeth, but in some genera these are wanting, as in *Pottia* (Plate, figs. 3 and 4); the row of teeth surrounding the top of the urn is known as the peristome (Gr. *peri*, about, and *stoma*, mouth). In the axis of the urn there is a column of large-celled tissue, called the columella; outside this lies the layer of cells, which become changed into spores. A layer, two or three cells thick, surrounds the spores, known as the spore-sac; exterior to this there is an air cavity; and then comes the outer wall of the urn, three or four cells in thickness. In the genus *Polytrichum*, there is a layer of cells which remains attached to the points of the peristome teeth, and is called the epiphragm. Many species have a swelling at the base of the urn, which is known as the apophysis.

The genus *Pottia* (Plate, figs. 3 and 4) belongs to what are called the acrocarpous mosses, that is, to those in which the fruit (urn) is situated at the apex of the branches (Gr. *akros*, apex; *karpon*, fruit). The species have straight oval capsules (figs. 3a, 4a), without peristome, and their leaves (fig. 3b) are large-celled, in contrast with the leaves of the nearly allied genus *Gymnostoma*, in which the cells are small and dense. Fig. 4c is the enlargement of 4; a shows the lid and b the calyptra.

The genus *Splachnum* (Plate, fig. 5) is also acrocarpous. Many of the species are remarkable for the peculiar shape of the apophysis; for instance, in the European species *Splachnum rubrum*, it is like an umbrella; in *Splachnum Gunnii*, which grows in Tasmania, it "resembles a Turk's-cap gourd." In the British species, *Splachnum ampullaceum*, it is top-shaped, with the small cylindrical urn above, the whole shaped somewhat like the ancient

*ampilla*. Fig. 5a shows the tapering apophysis and small urn of *Splachnum minoides*. The species have a single peristome of sixteen teeth in pairs.

The genus *Grimmia* (fig. 6) is acrocarpous with a single peristome of sixteen equal teeth (fig. 6c). The seta is generally curved, and the columella is not attached to the lid, as in an allied genus. Fig. 6a is an enlarged figure; b shows the urn.

*Dicranum* (fig. 7) is a large genus, with nodding unequal urn (a), with split calyptra (b), beaked lid (c), and sixteen equidistant bifid teeth (d).

*Tortula* (fig. 8) is another large genus of acrocarpous mosses, easily known by its thirty-two thread-shaped teeth (d) being twisted into a common bundle (c). The plant (a) and the capsule (b) are both enlarged.

The genus *Orthotrichum* (fig. 9) has an erect striated urn (b), with a beaked lid (a), a furrowed campanulate calyptra (c), and single or double peristome, the outer of thirty-two broad, flat, teeth (d) combined into eight or sixteen.

Three genera are represented in **CRYPTOGAMIA** (Plate II). The genus *Ptycomitrium* (fig. 11) has an erect regular urn (a), a deeply furrowed pointed calyptra (b), a beaked lid (c), and a single peristome of sixteen equidistant bifid teeth (d).

The genus *Bryum* (fig. 12) has a pendulous urn (a), with a double peristome, the outer of sixteen teeth, the inner a membrane divided half way into sixteen segments (b).

*Bartramia* (fig. 13) has a globose strated urn, with or without a peristome, sometimes double, the inner consisting of a membrane divided into sixteen processes splitting along the middle, sometimes with cilia (b), the outer consisting of sixteen equidistant teeth (c).

**MOSUL** or **MOZUL**, a town of Turkey in Asia, situated on the right or western bank of the Tigris, here crossed by a bridge of boats 300 feet in length, and 216 miles N.N.W. from Bagdad. Mosul is the centre of an extensive commerce. From its manufactures of cotton cloths the word *muslin* is derived, but these are now supplanted in the bazaars by European goods. The population, which is variously computed at from 20,000 to 40,000, consists chiefly of Arabians, Turkish, and Kurdish Mohammedans; about one fourth are Christians, and 1500 Jews. The town is the seat of a Jacobite patriarch, and was formerly the metropolis of the Mesopotamian Christians. The streets are narrow and unpaved. There are numerous baths, bazaars, coffee-houses, about thirty mosques, nine or ten Greek churches, a Dominican convent, Turkish college, and barracks. On the eastern bank of the river the ruins of ancient Nineveh exist, many interesting remains of which were discovered by Mr. Layard.

**NOTES or MOOTS**, among our Anglo-Saxon ancestors, were public courts of justice, or general meetings of the people, assembled for legislative or municipal objects. These courts are often mentioned in our English history under different names—as the Burgenote or Burgmoot, meeting of the burghers; Folenote, meeting of the people; Hallgemote, the hall meeting; Hundredgemote, meeting of the hundred; Shiregemote, a county meeting; Wardenemote, a ward meeting; Witenagemote, a meeting of the “wise men” of the Witan, or great national council. The Mote-bell was the bell used by the Saxons to summon the people together at the motes.

**MOTET** (Ital. *motetto*), in music, a vocal composition set to sacred words, and used in the Catholic Church. The word was synonymous with anthem when first introduced. It signifies a kind of hymn developed at great length in a strictly contrapuntal style, often in more than one movement, and accompanied only by the organ.

**MOTHER CAREY'S CHICKEN** is the familiar name given by sailors to the storm petrel and other small oceanic species of petrels. The name Mother Carey's Goose

is given to the great black petrel or gigantic fulmar of the Pacific Ocean. See **PETREL**.

**MOTHER-OF-PEARL** (Fr. *nacre de perles*, Ger. *perlen-mutter*) is the beautiful silvery enamel or animal gluten which, with alternate strata of carbonate of lime, composes the internal layers of several kinds of shells. Those of oysters are often adorned with brilliant purple and azure hues, but the oysters of the Indian seas alone secrete this enamel in sufficient thickness to render it available for the manufacturer. Both the finest pearls and the finest mother-of-pearl are obtained from the genus *Pentadina*, which abound on the coasts of Ceylon and in the Persian Gulf. The brilliant hues of this curious substance are produced by its structure, the minute furrows which traverse the surface of every lamina being acted upon by the reflected light so as to become iridescent. It requires great care in manipulation. Very fine saws, drills, and files are used, and also an acid, such as dilute muriatic; it is polished by colcothar. It is used in inlaying fancy woodwork and *papier mâché*, and in making small ornamental objects; but by far the greater portion of it is used in the manufacture of buttons, which are chiefly made in Birmingham. Mother-of-pearl shells are found in almost every part of the world; those from the Philippine Islands being the finest in quality and the largest in size, many of them measuring as much as 12 inches in diameter. [See **SHELLS**.] The shells from Panama, known in commerce as “Bullock-shells,” are small and thick. There are two varieties—the white or silver-lipped and the black-lipped. The imports vary from 30,000 to 50,000 cwt. per annum—the average value being about £2 per cwt.

**MOTHS** (*Heterocera*) form a great division of the **LEPIDOPTERA**, an order of **INSECTS**. The moths are distinguished from the **BUTTERFLIES** chiefly by the form of the antennæ, which in the latter are long and straight and thickened into a club at the extremity; in the moths these appendages may be thread-like, bristly, feathery, or provided with branchlets like the teeth of a comb. In addition all butterflies are diurnal in their activity, while most moths, at least in England, fly during the evening or night. Moths are usually divided into eight large families or groups, which are extensively subdivided.

The **Sphingidæ** or **HAWK MOTHS** are among the largest and stoutest of the **Lepidoptera**. Their wings are long, narrow, and pointed, and their flight is very swift and strong. To the restricted family **Sphingidæ** belong the privet, the death's-head, and humming-bird hawk moths. The **Clear-wings** (**Ægeridæ**), which present a mimetic resemblance [see **MIMICRY**] to bees, wasps, and ichneumon-flies, belong to this group. The tropical day-flying **Uraniidæ** and **Castriidæ** are also referred to this group, though some place the first among the **Geometridæ**. The **Zygaenidæ**, containing the green foresters and the burnets, are intermediate between this group and the following.

The **Bombycidæ** (Plate, figs. 1-6) contain large and beautiful moths with thick clumsy bodies, broad wings, and the mouth parts often so far obsolete that the perfect insect is incapable of taking any nourishment. The Common Silk-worm Moth (*Bombyx mori*), the chief of the silk-producing species of this family, is a native of China, but has been naturalized in Europe since the sixth century. *Attacus cynthia* (fig. 1) has been introduced from China, and produces good silk. [See **SILKWORM**.] To the group **Bombycidæ** belong the lobster moth, taking its name from the extraordinary appearance of its caterpillar, the **Processionary Moth** (*Cnethocampa processionea*, fig. 3), so called from the habits of the larvæ, which march in regular order to their feeding places, the eggars (fig. 2), the emperor moth, and the wool leopard moth (fig. 4). The **Hepialidæ** or **Swifts** contain the ghost moth, which is white and has a peculiar hovering flight, the goat moth, the caterpillar of which was eaten by the Romans, and other forms

The Psychidæ are small moths remarkable in that the females are always devoid of wings, and sometimes have neither legs nor antennæ: the caterpillars construct movable cases, like those of the caddis-worms, in which the females remain after undergoing their metamorphoses. The Noctuidæ form a large group of nocturnal moths. They are distinguished by their broad bodies and dull coloured wings. The fore wings are narrow and smaller than the hind wings, which are folded under them in repose. One of the largest moths known, the great owl moth of Brazil, belongs to this group, as does also the beautiful and rare British moth, the Clifden nonpareil. The Geometridæ or LOOPERS are so called from the peculiar mode of progression adopted by their larvæ, which have only four pro-legs. The swallow-tail, brimstone, magpie, and heath (fig. 7) moths belong to this group.

The remaining groups of moths are known as Micro-Lepidoptera from their small size. The Pyralidæ (fig. 12)



Social larvæ of *Yponomeuta padella* feeding on the apple tree.

are distinguished by their long slender bodies and legs, large fore wings, and very long and slender compressed palpi. The Meal Moth (*Pyralis farinalis*) feeds in the larval state on flour, straw, &c. Hydrocampa and its allies are very remarkable for the aquatic habits of their larvæ. The Bee Moths (*Galleria*) are parasitic in the hives of bees, the larvæ constructing silken galleries in the comb on which they feed.

The Tortricidæ (figs. 13, 14) or Leaf-rollers, are remarkable for the habits of their larvæ, which live in the rolled up leaves of trees, or construct a rude tent out of them; others, as *Carpocapsa*, feed on fruit, especially the apple and plum. One of the commonest English species of this family is the Green Oak Moth (*Tortrix viridana*). They are usually small dun-coloured moths, and when at rest

somewhat resemble a bell in shape. The Tineidæ (figs. 9-11) contain a number of small moths which are very destructive in many ways. The clothes moths, which belong to this family, feed on dried animal substances, as cloth, hair, feathers, constructing for themselves a closely fitting tube out of the same. Many of them mine the leaves of trees and shrubs in their larval states, their numbers often making their depredations very serious. The subjoined cut represents the larvæ of the Little Ermine Moth (*Yponomeuta padella*) feeding on the apple tree; these larvæ envelop the trees on which they feed in a mass of silken threads forming large and tough webs.

The Pterophoridæ or Plume Moths are readily distinguished by their fissured and plumed wings. In the Twenty-plume Moth (*Alucita polydactyla*) each wing is split into six separate feathers, which in repose are folded together like a fan.

**MOTION** is change of place. There has been motion when a body at one time occupies a part of space different from that in which it was at a preceding time. The only addition necessary to the conception of motion is that of the idea of continuity of change; every point which has moved from one point of space to another must have passed over every part of some line, straight or not straight, drawn from one point to the other.

Some of the ancients used the word in a more general sense, answering to change. Thus, according to them, creation, generation, corruption, increase, diminution, and change of place are the six sorts of motion. When *local* motion is sometimes spoken of in old writings this is the term by which simple change of place, to which the word motion is now restricted, is distinguished from the other changes which the same word then denoted.

If we consider merely motion, without any reference to the matter moved or the quantity of external force required to move it, we have a subject of pure mathematics before us. Newton, for instance, used considerations of motion without hesitation in his fluxions.

But if we consider matter in motion we must inquire into the external causes of motion, and the capabilities of matter with respect to it. This we shall do in the succeeding article [see MOTION, LAWS OF], confining ourselves for the present to the first-mentioned branch of the subject.

Next to the idea of motion comes that of swiftness, rate of motion, or velocity, suggested by observing different motions or different changes of place in the same time. [See VELOCITY.] But here we must observe that we are rather indebted to motion for our measure of time than to time for our measure of motion. If sentient beings like ourselves had lived in perpetual day, without any recurrence of periodical phenomena in nature, or any mechanical means of generating equable motion, we have no right to suppose that they would ever have learned to consider time as a measurable magnitude. They might admit that it might be more or less, as we do of industry, courage, or any other moral qualities, but we cannot be more destitute of measures for those qualities than they would have been of means for measuring time. Since, however, we have obtained, though by means of equable motion, a distinct idea of successions of duration equal in magnitude, we use this idea in the definition of motion. Considering the motion of a simple point which describes a line, it is called uniform when the lengths described in successive equal times are equal, *whatever each time may be*. In uniform motion an arbitrary unit of time is chosen, and the length described in that time is called the *velocity*, which is simply the Latin for quickness.

When equal spaces are not described in equal times we can imagine the rate of motion to change either gradually or discontinuously. Thus it can be imagined that a body which moves for some seconds uniformly at the rate of 10 feet in a second, may at once, without any intermediate

state, take a velocity of 20 feet. But such a conception cannot be realized on any material body, though there may be all the appearance of it. When the rate of motion is changing perfectly gradually, there seems to be no direct method of obtaining the rate at any one instant; for no successive equal spaces are described in equal times. For our present purpose, however, it may be sufficient to take a length so small that the change of rate undergone in passing through it is insensible, and to consider the point as moving uniformly through that length. Let the very small length  $s$  be described in the small fraction  $t$  of a second; then  $s:t$  is the length which would be described in one second at the same rate, since  $t:1::s:\frac{s}{t}$ , and  $\frac{s}{t}$  may be taken for the velocity.

The existence of motion is detected either by a change of the distance of an object or of its direction, or both; but it is not necessarily the object which moves. The spectator himself may be in motion unconsciously, and it is matter of common experiment that every motion of the spectator of which he is not conscious, and every rapid motion, whether he be conscious of it or not, causes surrounding objects to appear in motion. In walking the effort necessary to maintain motion perpetually reminds us that it is ourselves who move; in a carriage, at an ordinary pace, we can always destroy the illusion of surrounding motions by a moment's thought. But if the attention drop, and we look at objects with the mind intent on other things, they soon take the motion of the carriage in a contrary direction. In the smooth motion of a boat, as a rule holding good for most persons, no effort of thought will enable the spectator to realize his own motion and destroy that of the shore or a neighbouring vessel. This consideration is important as affecting the problem of the motion of the earth.

It may also happen that the object is in motion as well as the spectator, in which case the latter motion will be transferred to the former. The whole motion of the object, compounded of that which it has of its own and that which it appears to have from the motion of the spectator, is called the *apparent* or *relative* motion.

**MOTION, LAWS OF.** The rules or laws of motion mean those universal methods of receiving and losing motion which close attention to mechanical phenomena, coupled with strict inductive reasoning, has shown to be inherent in the constitution of matter.

To an intelligent but untrained observer matter seems to have no power of moving itself, though, if we judge from the fall of bodies towards the earth, the phenomena of magnetism, &c., it would appear as if matter might be the cause of motion in other matter. And it seems, moreover, that motion is an accident of matter which diminishes and dies out of itself if some sustaining cause be not perpetually in action: for in all cases in which the experiment can be tried we find that moving bodies are reduced to rest by being left to themselves. The motions of the heavenly bodies, it is true, appear to be permanent; but we have no certain assurance that there is not a constant sustaining *physical* cause of this permanency. There would be something of truth and a good deal of falsehood in the preceding conclusions.

It will make some difference in our method of seeking for the laws of motion, whether we suppose the earth to be at rest or in motion. Now the decisive proofs of the motion of the earth, as it happens, are themselves derived from certain consequences of the laws of motion. This is reasoning in a vicious circle; nor is there any mode of escape except by establishing the truth of these laws, independently of the consideration whether the earth be at rest or in motion. And the process will be—first to detect laws for which there is a high and almost overpowering degree of probability in their favour; next to appeal to

the above-mentioned uniform truth of the results deduced from the assumption of such laws for the conversion of this high state of probability into one of absolute demonstration.

We will first assume the motion of the earth: every point of its surface, then, is in a state of revolution round the axis, while at the same time the whole is carried forward round the sun; to which we must add the slight motion arising from the precession of the equinoxes, and the possible translation of the whole system in space. But this motion is very different in different parts; at the pole, for example, there is no diurnal motion, near it only a small one, while at the equator there is a considerable one. Our first idea might be, then, that at the different parts of the earth some modification of general laws would be observed, arising from the difference of the motions of the several places. On the contrary, the first law of motion which we can establish arises from it never having been observed that any notice need be taken of the difference of place on the earth in estimating effects of motion. It is not found necessary to write different treatises on gunnery for different latitudes, nor to alter the disposition of parts in any machine moved from one latitude to another to produce a more advantageous effect. There is, it is true, a small diminution in the weight of bodies as they are carried toward the equator, and the results of this are apparent in experiments in which the acquisition of motion depends upon weight, or rather upon its proportion to the quantity of matter. But this very problem of the pendulum is one in which the question of the truth of the laws of motion is established by a test which would detect the smallest quantities, and furnishes an answer to those who might say that the possible effects of the difference of diurnal motions, though not distinguishable in such cases as that of a cannon-ball, might be perceptible in delicate instruments.

If to the motion of the earth we superadd another, such as the motion of a carriage, the same sort of result is found. Those who move on a well-laid and smoothly-travelling railway at the rate of 30 miles an hour, or 45 feet in a second, do not find the relation in which they stand to the objects in the carriage in any degree changed by the velocity, &c. Hence we are led to the conclusion that all the relations of matter to matter remain unaltered if the whole system be made to move, provided that the same motion be communicated to all its parts at once. And though we do not, absolutely speaking, know what rest is, since no point of the earth, nor of any heavenly body, can be shown to be at rest, yet since we see that the relations remain unaltered when the velocity of a whole system is changed, we are led to conclude that the same laws which prevail when all the parts of a system have the same motion, would also prevail if the whole system were at rest; the ground of our presumption being, that the laws remain unaltered under any alteration of the common motion which it is in our power to make.

The second law of motion (for such it is called, though, as above shown, it must be deduced first when the earth's motion is considered) may be thus stated:—

If there be two or more causes of motion taking place in two different right lines, whether inherent in the body or external to it, their effects do not interfere, nor does either diminish or augment the effect of the other. If, for instance, the body  $A$  be subject to two actions, one of which, being entirely in the direction  $A\ B$ , would bring the body to  $B$  in a given time, and the other, entirely in the direction  $A\ C$ , would bring it to  $C$  in the same given time; then the body will



move from A to D precisely as it would have done if, moving along A B in the manner first specified, the line A B had been translated with its extremity A moving in the second manner specified, the said line A B not changing its direction.

The most simple and general method of stating this law is as follows:—The distance of a point from a straight line or plane, measured in any given direction, and as it will be at the end of a given time, is not affected by the action, during that time, of any causes of motion, provided they act in the direction of or parallel to that straight line or plane; or no force, in a given direction, can produce motion to or from a line in that direction. Thus if a ball were thrown up in still air in such a manner that it would mount 50 feet in one second, no imaginable horizontal current or whirlwind, however much it might alter the actual course of the ball, would prevent its rising 50 feet in the second. The statement of the law by Newton, namely, that (II.) *when a force acts upon a body in motion, the change of motion which it produces is in the direction, and proportional to the magnitude, of the force which acts*, is perhaps rather too vague to give a distinct notion to learners.

From the law just enunciated, we may learn that bodies upon the earth, moving with the earth, have the properties of bodies at rest with respect to all motions that are to be estimated relatively to the earth. We have, then, to inquire what is the natural state of matter on the earth? Can it preserve any motion of itself, or does every motion gradually slacken and die out, by the mere inability of matter to maintain it without the application of external causes? On this point we have only strong presumptions, which would be by themselves insufficient. We find that terrestrial matter, immediately on its being put in motion, encounters causes of retardation. The resistance of the air, and the friction of the basis on which the substances rest, are easily shown to lessen the motion of bodies which encounter them. The more nearly these are removed, the longer does motion continue. It is certain, then, that these resistances contribute in a great degree to the destruction of motion; but it is not therefore to be immediately assumed that there is no other cause. If we grant that a perfectly smooth ball, lying upon an indefinitely extended plane without friction, and not in contact with any atmosphere, would move for a long time without any sensible diminution of the rate with which it was made to set out, we grant quite enough to explain all that we see, without the necessity of supposing that the motion would continue for ever. The so-called first law of motion is thus stated—(I.) *Every body continues in its state of rest or of uniform motion in a straight line, except in so far as it may be compelled by impressed forces to change that state*. From the consideration of countless instances the conclusion is, that the state which matter, independently of external bodies, has been created capable of maintaining, is not merely rest, but also uniform motion in a straight line; and that it has no more tendency of itself to part with any of its velocity, nor to move slower or faster than it was first made to move, than it has to set itself from rest into motion.

The third law of motion was enunciated by Newton as follows:—(III.) *To every action there is always an equal and contrary reaction: or the mutual actions of any two bodies are always equal and oppositely directed in the same straight line*; which requires a definition, and this definition will require the statement of the principle, or something amounting to it, in a more definite form. We may readily suppose that when matter communicates to other matter motion which the latter had not before, the former must lose some of its own. On any other supposition the connection of matter with other matter would create motion; but this it would seem to do in the case

of attraction, so that the *prima facie* objection to the supposition of matter creating motion seems to be answered by an instance. It must, however, be observed that in every case of nature, the creation of motion by attraction is mutual. If the sun attracts the earth, the earth also, in its smaller degree, attracts the sun in strictly relative proportion. If a magnetic and non-magnetic needle be placed in water, not only will the magnetic needle move towards the other needle, but the other needle towards the magnetic needle. It appears, then, that opposite motions are to be considered as contrary effects; and, if applied to the same body, we know that they would destroy one another. In like manner then, as, in considering the first law of motion, we have to learn that maintenance of uniform velocity must be looked at as inherent in matter, and as not arising from external causes; so in the third we are taught to consider opposite velocities as negations each of the other—so that the creation of both is equivalent to the creation of neither, and not, as might be supposed, requiring two new and distinct causes of motion.

But the most essential part of the principle is derived from observation of the fact that, other things remaining the same, the more matter is moved the more slowly is it moved. If the magnetic and non-magnetic needles be of equal mass, they will at the end of any time have equal and contrary velocities; but if the magnetic be double of the other, it will in the same time acquire only half the velocity. In fact, confidently as we feel entitled to expect that, in some sense or other, action and reaction will be found equal and contrary, we have not learnt the meaning of the word action as long as we think only of velocity, and not of the quantity of matter in which velocity is created. A cause of motion once existing, and which was entirely expended in giving a velocity of 100 feet per second to a ball of 2 pounds weight, would have given 200 feet per second to a ball of one pound weight. Hence it is *momentum* which is the measure of the action of matter upon matter, and the definite enunciation of the third law is as follows:—Whenever any matter gains momentum in one direction, other matter either loses as much momentum in that direction, or gains as much in the contrary direction. Action, then, is creation or destruction of momentum; reaction is destruction or creation; while the destruction of momentum in one direction, and its creation in the contrary direction, are equivalent effects.

The absolute strictness of this law, probable as it is rendered by terrestrial observations, is proved in the same way as that of the others, namely, by the observation of the conformity of its legitimate deductions with observed facts. Thus in mechanical appliances we find that what is gained in power is lost in speed; if we lengthen the leverage of a LEVER we gain power, but we lose motion; we expend much motion (though it is easy work) to gain a little motion, which, however, is powerful; and *vice versa*, if we shorten the leverage. Further, the grand doctrines of the conservation of energy and the transmutation of forces arise directly from this third law (as heat becoming motion; electricity light, &c.), a result dimly hinted at by Newton, and left for others to work out.

**MOTION OF THE EARTH.** The theory of gravitation has placed this question on a footing entirely different from that on which it was argued, whether by Aristotelians or Copernicans. Both of the parties named supposed the existence of a fixed central body somewhere, which the first of them would have to be the earth and the second the sun. This notion of a *centrum mundi*, or centre of the universe, is exploded.

When the work of Copernicus (Copernicans) appeared in 1543, it seems to have been considered as a mere attempt to demonstrate or show the motions of the heavenly bodies in a more simple way. Guarded as it was by the expressions of the preface, it was neglected as a purely speculative

trial of a strange and impossible hypothesis. Copernik himself treated his own ideas as a reproduction of those of the ancients, and in truth the existence of such a doctrine as the earth's motion was perfectly well known to all men of learning. Aristotle (in his second book on the Heavens) states that Pythagoras and his followers placed the sun in the centre, on account of the superior excellence which they attributed to the element of fire, of which they supposed the sun to be made. Different authorities give the same opinion (whether with or without the reason) to Philolaos, Anaximandros, Seleukos, Kleantès, Leukippos, Herakleides, and Aristarchos.

Copernik had no predecessor as a mathematical reasoner upon the question. The first continental followers of the new system were Rheticus, Reinhold, Mastlinus the instructor of Kepler, and Urstinus, who was probably the instructor of Galileo. In 1556 appeared in England the "Castle of Knowledge," by Recorde, in which a cautious and implied avowal of Copernican principles is made, and also the "Ephemeris" of John Field, expressly computed from Copernik and Reinhold. John Dee and his pupil Thomas Digges were both avowed Copernicans: the first absolute defence of the system is contained in the appendix to the "Prognostication Everlasting," &c., of Leonard Digges, republished by Thomas Digges (who added the appendix) in 1594. This appendix is called "A Perfit Description of the Celestiall Orbes, according to the most Ancient Doctrine of the Pythagoreans; lately reuiued by Copernicus, and by Geometricall Demonstrations approved."

Hitherto the theological part of the controversy has not made its appearance. We must date this view of the question from the discoveries of Galileo. Neither in ancient nor modern times have those who would bind over the sciences to agree with *their* interpretation of the Scriptures ever taken alarm at hypotheses, until those hypotheses began to have facts in their favour. The inconsistency is worth noting; for taking these objectors on their own principles, there may be impiety in propounding a theory which contradicts the Bible, but there can be none in stating the results which follow from actual investigation; the fawful thoughts of the mind of man may contradict revealed science (if such there be), but the actual works of the God of nature can hardly detect falsehood in the God of revelation. It was Copernik then, and not Galileo, who was the heretic, if heresy there were in the case; but the former and his immediate disciples slept in peace, while the latter was forced to sign a recantation. See GALILEO.

The controversy ceases to have any interest after the publication of the "Principia" of Newton. Even to this day, however, there are some who deny the earth's motion, as there are persons who believe in ghosts; but no one much cares to interfere with these outworn absurdities, harmful only to their owners.

**MOTION, PROPER,** of stars, &c. Speaking generally, it is sufficiently accurate to say that the stars are fixed and the planets movable; that the "vault of heaven is studded over with patines of bright gold," which keep the same positions relative to one another, and move all in one piece; and that this motion is not a real but only an apparent motion, caused by the daily rotation of our own earth upon its axis.

But in strict accuracy things are not so. The stars do not remain stationary among themselves. The shapes of the constellations are slightly altering, and a remarkable instance is given in the article GREAT BEAR. In some of the nearer stars this motion, called the *proper motion* (in contradistinction to the "apparent motion" due to the earth's rotation), is sufficiently marked to be easily measured, and it has been accurately computed for many stars. For instance Arcturus (the bright star in BOÛTES) is travelling at the rate of at least 54 miles a second, which is

three times faster than the rate at which our earth travels round the sun, and about a thousand times as fast as an ordinary railway train. The earth itself and its sister planets, with the sun at the centre, form one star, doubtless, to the inhabitants of Arcturus, if such there be; and this compound star of ours is no exception to the rule just stated. We are travelling as an entire system at the rate of 4 miles a second in the direction of the constellation Hercules; and we find year by year that the stars in that direction are opening wider, while the stars in the opposite direction are drawing together; the same optical effect as happens to every traveller with the trunks of the trees when he is walking through a pine forest.

**MOTION OF PARTS,** in music. See PART.

**MOTIVES or ENDS OF ACTION** are the stimuli which move the will to action. Sometimes it is said that our *desires* are motives; but, rightly apprehended, *desire* is a state of conflict arising when a motive is prevented from immediately acting itself out—it is a state of suspense.

All motives, pushed home, are simply our natural pleasures and pains, either those of the senses and the bodily well-being, or of the emotions. We are attracted by the pleasures and repelled by the pains, and our actions naturally tend to follow in accordance with the motive. Besides the actual pleasures and pains, the memory of actual pleasures and pains, or the imagination of possible pleasures and pains, must be added to the list of motives, and the keener is the pleasure or pain (or the memory of it) the sharper does it act as a motive. It follows that persons of education and sensibility are moved by many motives quite unintelligible to coarser or more ignorant minds, as the memory and imagination of the first act with a vividness derivable only from actual facts with the second. Beyond this, some minds are innately more sensitive than others, and thus obtain an abnormal strength of motive in those departments of feeling wherein they are specially sensitive. In general, however, a motive is keener (1) as it is the result of continually repeated pleasure or pain; (2) as it is fresh in the memory; and (3) as it rises in intellectual rank. A pleasure often tasted (though not to satiety) holds its due appreciation from us; a pain often felt is more terrible in inciting us to measures of alleviation. Further, a pleasure fresh in the memory allures us, as a general thing, more than one whose date is of long ago. And finally, the more refined and subtle a motive is, the more persistently does it operate upon the character. Palissy, the potter, burnt his very chairs and tables when he needed firewood suddenly to complete his furnace-work for his great re-discovery of the art of fine glazing. Newton was found one afternoon with the stocking still in his hand which he had taken up as he rose from bed in the early morning; a light had dawned on one of his mathematical problems, and class-rooms, meal-times, and the ordinary things of life vanished as motives from before it.

Many motives which are rightly but means towards the acquisition of pleasure or the avoidance of pain become by their constant pursuit ends in themselves. Such are the instances just given as to knowledge; such are also money, etiquette, rank, &c. And, as follows from the remarks above as to the relative keenness of motives, the original subtle intellectual nature of the motive gives it an intensity far beyond its real strength. In no case is this more manifest than in the ignoble greed for money *as money* which so frequently overmasters every consideration of humanity and honour in those who began by valuing money at its proper worth, that is, according to the gratifications and safeguards which it can provide.

In the conflict of motives, the stronger motive overpowers the weaker. It is incumbent upon us therefore to strengthen by habit, by education, and by continued repetition, in fact by every means in our power, those motives which we agree to recognize as the higher—that is, those which make the

most for the well-being of mankind; and to weaken by opposing treatment those motives which experience has proved to be injurious to society. For instance, benevolence and sympathy, which are the sources of our purest pleasures, and our means of doing the greatest good, are in their beginnings very weak compared as motives with the coarse acute craving for selfish pleasures. In childhood the first are practically absent, so fierce are the demands of self-preservation; but as the little life grows more secure of itself, the influence of training and good example may soon bring out the higher motives in good force.

**MOTIVO**, in music. See *LIT-MOTIF*.

**MOTLEY, JOHN LOTHROP**, a celebrated American historian, was born 15th April, 1814, at Dorchester, now a part of Boston, Massachusetts. He was educated at Harvard University, where he graduated in 1831, and he afterwards studied for two years at Göttingen, and spent a further period in European travel. On his return to the United States in 1834 he adopted the legal profession, and ultimately was called to the bar. His first literary efforts were in the direction of historical romance, but his two novels "Morton's Hope," dealing with the period of the American Revolution and published in 1839, and "Merry Mount," a tale of early colonial life published in 1849, were only moderately successful. In 1841 he was appointed secretary of legation at St. Petersburg, but resigned the post after a few months' service. In 1846 his historical studies led him to form the design of writing a history of the great struggle of the Dutch against the power of Spain. Finding the materials at his disposal in the United States quite inadequate for the proper completion of his work, he removed with his family to Europe in 1851, and after five years' painstaking research among the archives preserved at Berlin, Dresden, Brussels, and the Hague, he published in 1856 in London and New York "The Rise of the Dutch Republic." By scholars this work was welcomed as a piece of solid and original historical research, while the graphic and eloquent style in which it was written, and the glow of sympathy it displayed with the Dutch in their heroic struggle, gave it a wide popularity with the reading public. It quickly ran through several editions in English, and it was translated into French with an introduction by Guizot, into Dutch with an introduction by the Dutch historian Bakhuisen van den Brink, and also into German and Russian. Pursuing his studies, Motley published a continuation of the narrative in his "History of the United Netherlands" (1860-65), bringing it down to the time of the Synod of Dort. From 1861 to 1867 he held the post of United States ambassador at Vienna, and he was ambassador at London in 1869-70. After a visit to America he finally took up his residence in England in 1872. In 1874 he published "The Life and Death of John of Barneveld, with a view of the Primary Causes and Movements of the Thirty Years' War," and he was engaged on a history of that prolonged conflict when he died at Kingston Russell House, near Dorchester, Dorsetshire, 29th May, 1877. During his lifetime he received a variety of honorary degrees, and he was made a member of a number of the learned societies of Europe and America.

**MOTMOT** (*Momotus*) is a genus of American birds belonging to the order Volitores and family Motmotidæ. The motmots resemble the bee-eaters (*Meropidæ*) considerably in outward appearance, but they are distinguished by having the margins of the mandibles distinctly notched or serrated for a considerable portion of their length. The tail is long and graduated, and its two middle longest feathers are destitute of vanes for about an inch from the extremity. It has been now placed beyond doubt that the bird picks off the vanes with its bill, and so forms two rackets at the extremity of the tail. Little is known of the habits of these birds, as they are solitary in their dis-

position, residing, usually in pairs, in the deepest recesses of the forests. They feed principally upon insects, which they capture by pouncing down upon them suddenly. Besides insects, however, they are said occasionally to devour small snakes and lizards, and even small birds, and sometimes to feed upon fruits. According to some they make no nest, but rear their young in a hole in the sand, generally on the side of a hill; others assert that a nest is made in the holes of trees. The name of *motmot* is said to be derived from the peculiar note of these birds, which is described as resembling those syllables slowly repeated. According to other writers, however, the cry of the motmot is comparable to the syllables *toutou*. About seventeen species have been described. The Brazilian Motmot (*Momotus braziliensis*), which is not uncommon in several districts of the tropical parts of South America, is about the size of our common blackbird; its general colour is green, but the face, and a spot in the middle of the breast, are black, and the head is blue.

**MOTTO**, an Italian term, shortened by some of our old writers to *mot*, which means a word or sentence added to a device, and is commonly used, when put upon a scroll, as an external ornament of coat-armour. A sentence or quotation prefixed to anything written is also termed a motto.

**MOUF'LON** (*Ovis montanus*) is a species of wild SHEEP at one time common in South Europe, and especially Spain, but now almost restricted to Corsica and Sardinia. The mouflon is about the size of a small fallow deer. The horns, which are confined to the male, are large, curving backwards and then inwards at the tips. The upper parts of the body are brownish, the face and legs whitish; the tail is very short. The mouflon frequents mountainous regions, and is seen in herds of 100 or more, headed by an old ram. It breeds freely with the domestic species, and has itself been domesticated.

**MOULD** is a name applied to all minute fungi which appear in masses upon organic bodies. It appears to be consequent upon a damp atmosphere and a diminution of light, both which conditions are favourable to the development of those bodies whose spores or reproductive particles are floating everywhere in the atmosphere, ready to spring rapidly into growth whenever they chance to fall upon suitable situations.

All the fungi that constitute moulds are so small as to escape observation, except when from their numbers they form microscopical forests, and then they clothe the surface of the body which they attack with light patches of yellow, blue, white, green, red, and various other colours.

Most of these fungi are Mucorini. They form a blue mould upon bread, paste, and similar substances prepared from flour. These plants form a fine horizontal cobweb-like bed, from which rise up slender branches terminated by an expansion which bears the spores.

**MOULDINGS** (Fr. *moulure*), in architecture, any assemblage of narrow surfaces projecting from the face of a wall or other surface, and advancing one beyond the other. They are bounded by straight lines, either horizontal or vertical, according to their situation, but the surfaces themselves are plane or curved, and if the latter, concave or convex, or else compounded of both forms; and again are either plane or curved.

Mouldings are distinguished by different names, according to their profiles, their sizes, or their situations. Thus the *fillet*, *taenia*, *band* are all plane or flat mouldings. The *corona* is also a mere plain band, except that it is occasionally enriched in Roman architecture. Lesser convex mouldings are termed *beads*, but the longer mouldings of the same kind in the bases of columns are termed *tori* or toruses. The *cyma recta*, or *cymatium*, is a compound moulding, concave above and convex below; while the *cyma reversa* is convex below and concave above. The *carretto*

is a mere hollow or sweep intervening between and serving to connect two mouldings, one of which projects beyond the other. The *ovolo* is a simple convex moulding, so called because it is generally carved into *ova*, or ornaments in the shape of eggs, within hollows. All the other mouldings may be carved or enriched, except the cavetto and fillet, the pattern being accommodated to the surface of the moulding. The inverted cyma, ogee, or *talou*, as it is sometimes called, is cut with a peculiar kind of tongued or arrow-headed ornament.

In regard to Grecian mouldings, many of those which are uncarved were painted with some ornamental pattern, and not unfrequently in the most brilliant colours.

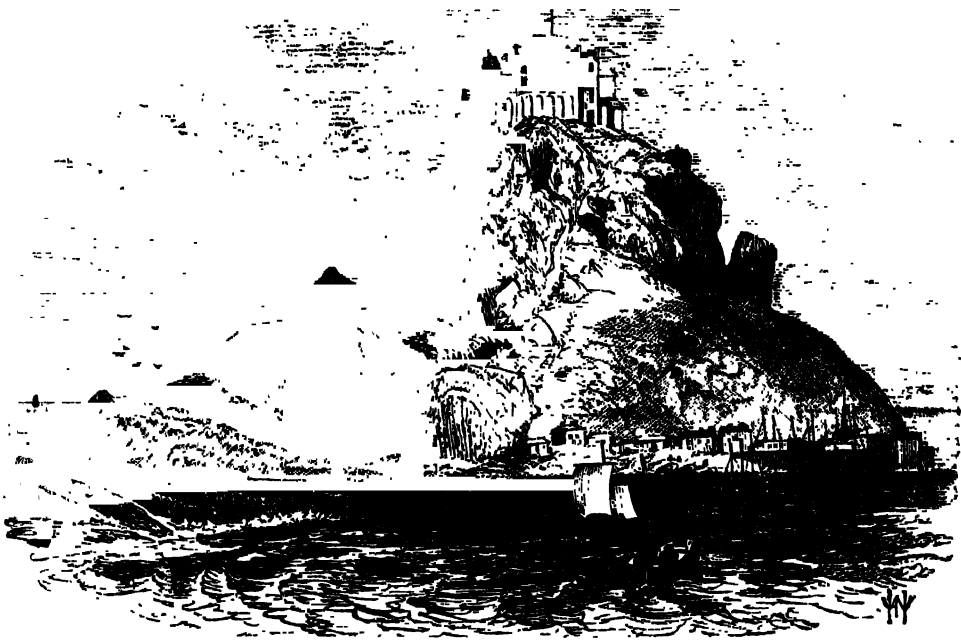
**MOULINS** are the holes formed in the rock bed beneath a glacier by the water, sand, gravel, and stones falling down through a crevasse on a particular spot. They have thus a similar method of formation to *giant's kettles*.

**MOUND BIRD** is the name given to birds belonging to the family Megapodidae and order GALLINA. The mound birds or megapodes are distributed over Australia, Borneo, and many of the islands of the Malay Archipelago. As in the curassows, the hind toe is placed on the same level as the anterior toes, so that its lower surface is applied to the ground. The feet are large and powerful, with the tarsi and toes covered with scales. The wings are short and rounded. The bill is stout and arched, with the tip rather obtuse.

The mound birds are very remarkable in their habits. Incubation is unknown. In its stead the eggs are laid in a mound of earth or sand, and hatched either by the warmth of the surrounding mass or by the sun's rays. These mounds are often very large, one described by Mr. Gould being 15 feet in height and 60 in circumference at the base, and appear to be formed by several

birds, and to be the result of several years' work. They differ much in their composition, form, and situation. Many are formed in dense thickets where the sun's rays cannot penetrate, and are composed of the finest vegetable mould, the result of the decay of vegetable matter. Others are formed of sand near the water's edge, and in this case the eggs are hatched like those of turtles, by the direct warmth of the sun's rays retained by the sand. Both male and female assist in forming the mound. The female lays one very large egg at a time, which is placed in an upright position. When hatched the young birds make their way through the sand, and are able at once to run and take nourishment. The megapodes are essentially ground birds, their flight being heavy and unsustained. The eggs are highly esteemed as food by both natives and Europeans.

About eighteen or nineteen species of the typical genus *Megapodius* are known. The Jungle Fowl (*Megapodius cumulus*) of the Australian colonists is of the size of a small fowl, and has the upper surface dark cinnamon-brown, with the back of the neck dark gray, which is also the colour of the lower surface of the body; the head is furnished with a rather short, pointed, occipital crest; the upper and lower tail-coverts are dark brown, and the tail itself blackish; the bill and feet are reddish. The native pheasant of the colonists is *Leipoa ocellata*. [See LEIPOA.] The Malco Bird of Celebes (*Megacephalon malco*) is the only mound bird in which the plumage is not sombre. It has a curious casque on the back of the head which, as well as the neck, is bright red; the general plumage is glossy black above and light pink below. Both sexes are nearly alike. The BRUSH-TURKEY (*Talegallus lathami*) is an Australian form with wattled skin on the head and neck.



Mount St. Michael, Cornwall.

pyramid of granite, intermixed with slate, greenstone, and veins of quartz, 250 feet high, situated on the northern side of Mounts Bay, between the two extreme southern

points of England, the Lizard and Land's End in Cornwall. It is about a mile in circumference, and is connected with the coast by a causeway which is generally dry at low

water. It has some most interesting monastic and feudal buildings upon it. The little fishing village at the foot of St. Michael's Mount has a few picturesque houses, and the harbour accommodates vessels of 500 tons. The legendary history of the isle commences as early as the fifth century. Edward the Confessor granted the priory by charter, in the middle of the eleventh century, to some Benedictine monks, and it was subsequently annexed to MONT SR. MICHAEL. From a very early period it was a fortified as well as a religious dwelling. It was held for King John for a short time; was seized by stratagem and defended by the Earl of Oxford for Henry VI. against Edward IV., but ultimately surrendered. Edward granted it to the Abbey of Syon, to which it remained attached till the Dissolution. Edward VI. dispossessed the Arundel rebels of it, and it surrendered to its victorious Parliamentary besiegers in the time of the Civil War. It seems now to be generally agreed that it is the *Isle of Diodorus Siculus*.

**MOUNT VERNON**, an estate on the right bank of the river Potomac, in Virginia, which was the seat of George Washington, the first president of the United States. He resided here for many years, and was buried on the estate. His residence, tomb, and part of the estate have been purchased by a society of ladies, to be kept as a place of public resort. Mount Vernon is about 15 miles from Washington.

**MOUNTAIN** is a term applied to those elevations from the level of the surrounding land which are most striking either on account of their steepness or ruggedness of outline, or of the great height to which their culminating peaks rise. It is usual to denote by the name of *hills* the minor prominences of the landscape, or those which do not rise higher than 1000 feet above the level of the sea, from which all heights are estimated; and to indicate as *mountains* the masses of land which exceed the elevation mentioned. But the latter term is necessarily used with considerable latitude, being applied to heights in one country which, in another abounding with those of a superior class, are of very subordinate rank. The origin of mountains has been carefully studied by geologists, and little or no obscurity now rests upon the subject. Two great and distinct causes have operated in their production—the wasting power of denudation and the gradual contraction of the earth's surface. While the materials of all the sedimentary rocks have been abraded from solid matter of older date, and aggregated by the action of water, their arrangement in grand independent elevations has, at least in some instances, been effected by the same agency. Examples occur in various localities of horizontally stratified masses, rising to a considerable height in perfect isolation, which show, by the direction and succession of their beds, that the strata of which they are composed were once continuous. They are the relics of formations which have been swept away by diluvial action from the intervening spaces, having, by being better defended from the powerful currents, or possessing a more indurated texture, withstood the denuding force to which the more yielding strata succumbed. On the west coast of Ross-shire, in the neighbourhood of Loch Assynt, several lofty conical mountains are conspicuous, from their form and geological distinctness, from the surrounding country. Suil Veinn, Coul Beg, and Coul More, about 3000 feet high, are the most remarkable of these objects. They are adjacent to each other, but quite insulated, of pyramidal form, and so regularly stratified as to resemble the courses of masonry in a pyramid. Their deep red colour is in striking contrast with the cold bluish hue of the gneiss which forms the plain on which they rest. It is supposed that an immensely thick bed of the same formation, older than the Silurian, once covered the whole surface of the Scottish Highlands, which subsequent denudation removed, with the exception of some fragmentary remains like the pyramidal hills.

With regard to the second great originating cause, the

gradual contraction of the earth's surface, the prime fact to be noticed is the universal plication and crumpling of rocks which were at first nearly horizontal. From the gentle undulations of the strata beneath the plains to the violent contortion and inversions among the mountains, there is that insensible gradation which connects the whole of these disturbances as parts of one common process. The only cause, as far as our present knowledge goes, which could have produced such widespread changes is a general contraction of the earth's mass. The interior mass has lost heat, and contracted in consequence more rapidly than the surface crust, when once the latter had been formed, and this has hence been obliged to sink down upon the retreating nucleus. In so doing a diminished area would have to be occupied, and this could only be accomplished by folding and crumpling. Strange though the statement may seem, it still appears probable that sinking and not upheaval has been one of the chief agents in producing mountains.

It is rarely the case that hills and mountains occur completely insulated, or in the midst of plains remote from kindred masses. The examples of the kind are chiefly active or extinct volcanoes. Neither are they often found in groups without being visibly connected by a continuous base. The common arrangement is for a series of elevations to present independent summits, but for the lower portions to run into each other; and thus form a belt or chain, the length of which greatly exceeds the breadth, and is variously linear in its course, angular, or curved. A grand chain consists of a number of parallel ranges, one of which has the boldest development and the highest elevation. Low heights generally mark the extremities, while the culminating points are towards the centre. Sometimes two ranges converge after running parallel to each other, and form a mountain-knot, then separating again. Secondary lines of mountains frequently diverge from the main chains at different angles, which in their turn send off spurs in various directions. These branches are the highest at the points of divergence, and thence gradually subside to the level of the adjoining lowlands.

Chains of mountains, though making many curves and angles, commonly correspond in their prevailing direction to the line of greatest length in the continent or country in which they are situated. This is very observable in the case of the Andes of South America and its North American prolongations, which, under different denominations and with few interruptions, form a vast and precipitous range of highlands, running more or less parallel to the meridian, and extending through a linear distance of 10,000 miles, from Patagonia to the Arctic Ocean. In a similar manner the eastern continent is traversed in the line of its greatest extent by a mountain-zone, with comparatively few breaks in its continuity. It stretches from the south-west coast of Europe to the north-east corner of Asia, and follows in its general direction the parallels of latitude through the greater part of its course. Beginning with the former locality, this highland region comprehends the Sierras of Spain; the Pyrenees, Alps, Carpathian and Balkan Mountains; the ranges of Taurus, Caucasus, and Elburz; the grand chains of the Hindoo-Koosh, Kuenlun, Thian-Shan, Altai, and Himalaya. Thence the line of height is carried northward by the Khingan, Yablonoi, and Stanovoi Mountains, being continued with a gradually-declining elevation to the shores of Behring's Strait. Secondary chains, as the Ghats in India, the Apennines in Italy, the Dovrefield and its connected ranges in Scandinavia, similarly correspond in their course to the greatest length of their respective peninsulas.

The slope of mountains may be either long and gentle or steep and abrupt. It is common, in the case of both primary and secondary chains, for this condition to be fulfilled by the declivities on one side being more precipitous than on the other. Thus the Alps present a much bolder

face towards Italy than towards Switzerland. The Himalaya chain rises with great abruptness to a stupendous height from the plains of Bengal, and declines gradually into high table-lands in the opposite direction. The Andes have a much steeper front on the seaward than on the landward side. This is the case also with the Scandinavian mountains, the ranges of Atlas, Taurus, and Lebanon, the Western Ghats in India, and the Sierra Nevada in Southern Spain. Few appearances are more deceptive than the amount of inclination which a distant mountain exhibits to the eye. The apparent steepness very far exceeds the real declivity. The Silla of Caracens, which rises to the height of from 6000 to 7000 feet, at an angle of  $53^{\circ} 28'$ , is a majestic instance of perhaps the nearest approach to perpendicularity of any great elevation yet known.

The contour of mountains is very varied. It is frequently indicated in their nomenclature by a prefix, as *pic*, a pointed height; *aiguille*, a needle; *sierra*, a notched or saw-like structure; and *cerro*, a hog-backed form. Hence the *Pic du Midi* of the Pyrenees, the *Aiguille Verte* and *Aiguilles de Dru* of the Alps, the *Sierra Nevada*, with its culminating point, the *Cerro de Mullagen*, in Spain. The particular configuration of the surface is everywhere determined mainly by its geological structure. Treeless hills and streamless valleys, both remarkable for a smooth-flowing outline, are characteristic of chalk districts. Bold, tabular looking, altar-like escarpments, overlooking well-watered valleys and plains, clothed with luxuriant grasses, and studded with noble timber, distinguish the Oolites and Lias. Rounded protuberances, like the heads of nails, in connection with deep romantic dells, walled by steep cliffs, highly cavernous, are features of the mountain limestone. Strongly-contrasted scenery appears in connection with the slates and quartziferous schists, where enormous crags and fearful precipices, with quiet lakes, roaring cascades, and sometimes magnificent woods, combine in the style of landscape. The terrace arrangement is common with basalts and porphyries; capricious twistings and crumplings are distinctive of serpentines and trachytes; and conical forms are generally assumed by volcanoes.

In all parts of the world, at a certain height above the sea, varying with the latitude, the high lands become *Nevadas* or snow mountains, and have their upper regions permanently attired in the garb of winter. In the torrid zone, where the heat is the greatest, the point of constant congelation, or line of perpetual snow, is of course the highest. Equidistant from the poles and the equator, or in latitude  $45^{\circ}$  degrees, the permanent snow is confined to mountains of considerable altitude, its lowest limit being about 8800 feet; and in the hot equatorial zone the lowest limit is at the height of about 16,000 feet. Mountains, and especially mountain chains, answer important purposes in the economy of nature, especially in relation to the hydrography of the globe. They arrest the passage of the clouds, while their cold summits act as huge natural condensers, forcing them to part with their moisture, which is discharged as rain or snow.

It is observable that mountain ranges decrease in general elevation from the equator to the poles. Nor is this an arbitrary or capricious arrangement, but obviously related to the gradual lowering of the snow-line in the same direction. If the main mass of the Alps, situated in the temperate zone, had been raised to the same height as the Andes in the equatorial, nations on opposite sides of the chain could never have communicated by a direct route owing to impassable barriers of ice and snow. Or if the Scandinavian highlands, in a higher northern latitude than the Alps, had the same general elevation, the inhabitants on either side could only have visited each other by sea. In the warm regions within the tropics, where the line of

eternal frost has its maximum elevation, the reliefs of the surface may have a boldness of development compatible with human intercourse, which they could not have in the colder without being insurmountable. The loftiest single projection at present known, Gaurisankar or Mount Everest, in the Himalaya, almost due north of Calcutta, rises to the height of 29,002 feet, or very nearly  $5\frac{1}{2}$  miles above the sea-level. In the opposite western hemisphere the culminating point, Aconagua, one of the Chilean Andes, attains the elevation of 23,910 feet. It may be noted that the highest land is near the Tropic of Cancer in the Old World, and inversely near the Tropic of Capricorn in the New. Transverse valleys are the only means of communication between the inhabitants on opposite sides of a high mountain range. Hence admitting of intercourse being maintained through them, they have the general name of "passes," and are also styled *puertos* (gates) by the Spanish, *les portes des nations* by the French, as capable of being closed to transit by a very slender military force, and "notches" by the Americans. In the Alps they are called *cols* (Lat. *collis*, a hill or ascent), the summit level being frequently at a great elevation, though thousands of feet below the altitude of the neighbouring peaks. The highest pass in Europe is the Col du Géant, a mule path on the eastern side of Mont Cervin, one of the Pennine Alps, which rises to 11,000 feet; but the Stelvio Pass, in the Rhetian Alps, is the highest carriage-road, ascending to 8850 feet. Practicable routes in the Himalaya range up to 20,000 feet. But merchants and pilgrims, who frequent them in great numbers, passing between India and Tibet, often encounter perils by the way fatal to life, owing to the debility caused by the rarefaction of the air, the severe cold, and the fall of fragments of rock, with masses of ice and snow.

The following is a list of some of the highest mountains in the world, the lowest of which exceeds 10,000 feet, or more than 2 miles in height.

	Feet.
Everest or Gaurisankar, Himalaya, . . .	29,002
Kunchinjunga, " . . .	28,150
Dhwalagiri, " . . .	26,826
Aconagua, " . . .	22,415
Nevada di Sorata, Andes, . . .	21,286
Nevada d'Illimani, " . . .	21,140
Chimborazo, " . . .	20,517
Cotopaxi, " . . .	19,350
Antisana, " . . .	19,260
Popocatepetl, Mexico, . . .	17,720
Ararat, Armenia, . . .	16,916
Elbüz, Georgia, . . .	18,526
Mont Blanc, Alps, . . .	15,732
Monte Rosa, " . . .	15,150
Geesh, Abyssinia, . . .	15,000
Peak of Demavend, Persia, . . .	18,600
Kasebeck, Georgia, . . .	16,546
Finster-aar-Horn, . . .	14,109
Ophir, Sumatra, . . .	13,840
Jungfrau, Alps, . . .	13,716
Orler Spitz, . . .	12,852
Peak of Teneriffe, . . .	12,236
Mullagen, Grenada, in Spain, . . .	11,678
Egmont, New Zealand, . . .	11,430
Miltsin, Barbary, . . .	11,400
Nethou, Pyrenees, . . .	11,168
Perdu, " . . .	11,030
Bielonka, Altai range, Tartary, . . .	11,068
Etna, Sicily, . . .	10,840

**Rainfall.**—The effects of mountains upon the rainfall are very conspicuous. Almost all rainless regions are caused by high mountain-chains having intercepted the moist winds in their course. In Peru, under the south-east trades, for

instance, the coast is quite dry, while the eastern slopes of the Andes are drenched with moisture. Lower down, when westerly winds prevail in Patagonia, the east coast is dry, while the rains on the westward are very heavy. The monsoons, breaking against the Himalayas, after absorbing the moisture of the hot and rapidly evaporating Indian Ocean, give an enormous rainfall; Cherraponjee, in the Assam Hills, being the wettest place in the world, with 400 inches (33½ feet) of water falling every year. A fine day must be a great rarity at Cherraponjee. Beyond the great mountains lie the great deserts.

**Temperature.**—The effects of mountains on temperature are also very great; for the intense cold of great elevations, with the consequent production of snow, ice, and glaciers, has a chilly effect upon the surrounding country, also the intervening valleys are deprived of much of their sunshine, and thus day is shortened, while at noon the reflection of the mountain sides intensifies the vertical heat, and they become insufferably hot. Mountains tend therefore to make the climate unequal, but on the whole colder.

**Density.**—Contrary to what might be supposed, the foot of a mountain is by no means an area of compression. On the other hand, it is the sea-bottom which is the densest part of the earth's crust. Mountains are produced by upward thrusts in the crumpling of the earth's crust, and their interior is likely to be full of rents and fissures formed in the process. This is discovered by freely suspending a long plumb-line near a mountain on the sea-shore, when the line deviates from the true vertical, but away from the mountain and towards the sea.

**MOUNTAIN LEATHER** is the felt-like substance formed by the matted fibres of asbestos, or some of the fibrous varieties of hornblende. It is not uncommonly found along the joints and division planes of greenstones and hornblende rocks.

**MOUNTAIN LIMESTONE** is the name applied originally to the carboniferous limestone, from its rising into prominent ranges of hills, especially in Derbyshire, and along the margin of the South Wales coalfield.

**MOURNING**, the clothes worn for some time after the decease of a relative or friend as an outward sign of grief. In Europe the ordinary colour for mourning is black, in China, white; in Egypt, yellow; in Turkey, violet; and in Ethiopia, brown. It was white in Spain till the year 1498. It is worn for different periods according to the nearness of the relationship of the deceased. On the death of a member of the royal family a court mourning is ordered. In ancient times the Greeks wore a coarse black dress, cut off their hair, and secluded themselves during the thirty days of mourning. Under the empire the male Romans wore black, and the women white mourning; the former for a few days only, and the latter for a year. A public calamity plunged the whole nation into mourning; and on the other hand, a public victory or festival shortened the time of mourning throughout the nation. See **FUNERAL**.

**MOUSAI'OS** (Lat. *Musaus*), a Greek poet, author of the interesting poem entitled "Hero and Leander." The most general opinion is that he lived in the lower ages of the Roman Empire. The poem consists of 340 hexameter lines, which contain the whole account of the beginning of the loves of Leander and Hero, the daring of Leander in swimming by night across the strait from Abydos to Sestos to visit his mistress, and the tragical end of both lovers. Ovid has treated the same subject in Latin verse in his "Heroides;" and we have in English the "Hero and Leander" of Marlowe and of Chapman. Schäfer's edition of *Musaus*, Greek and Latin (Leipzig, 1835), is an improved republication of Selrader's edition.

**The Legendary Mousaios.**—In the Greek mythology there is a Mousaios, son of Orpheus, and sharing many of his attributes. He rose to great fame as a poet, especially

in setting oracles and oracular precepts to verse; and he always had a semi-priestly character. He shares with Orpheus himself the honour of founder of the so-called Orphic religion, one of the great "mysteries" of Greece. Also the legends of Herakles represent Mousaios as presiding in the lifetime of that demigod over the mysteries of Demeter at Eleusis. The oracles of Mousaios were reverently collected and edited by order of the sons of Peisistratos at Athens, and the editor was fined and banished when it was discovered that he had tampered with the verses. When he died he was buried under a hill near Athens, which took from him the name of Musaeum (Mousaion).

**MOUSE** is the common name of many of the smaller species of the great rodent family **MURIDÆ**. The most typical mice, the mice and rats so common in houses, belong to the subfamily *Murina*, which is characterized by having the fore and hind limbs nearly equal in length, the thumb rudimentary, complete clavicles, the tail long and scaly, and by the absence of cheek-pouches. There are three molar teeth on each side in each jaw, rooted and tuberculate. On the characters of the upper molars the *Murina* are divisible into two sections, the *Mures*, confined to the Old World, and the American *Signodontes*. The *Mures* have large and broad molars, with three series of cusps across each tooth, while the *Signodontes* have narrower molars, with two cusps similarly arranged.

The Common House-mouse (*Mus musculus*) is so well known that no description of its habits or appearance is needed. White mice are albinos. In addition to their ravages in houses, mice get into ricks and do much destruction. The mouse is very prolific, producing five or six at a birth and breeding all the year round. The mouse, like the domestic rat, is cosmopolitan, having accompanied man all over the world. It is said to have been originally a native of India. The Wood-mouse or Long-tailed Field-mouse (*Mus sylvaticus*) is slightly larger than the domestic species, measuring about 4 inches, exclusive of the tail; the colour is reddish-gray above and white beneath. It is common in fields and gardens, storing up grain and seeds for winter use in subterranean burrows, which are excavated by its own labour, or else natural holes. It proves very destructive in our corn-fields. Its food, however, is not exclusively of a vegetable nature, for it will kill young birds, and even its own species. It is easily tamed. The **HARVEST-MOUSE** (*Mus minutus*) is, with one exception, the smallest British mammal.

Of the American mice the best-known species belong to the genus *Hesperomys*. The White-footed or Deer-mouse (*Hesperomys leucopus*) is very common in North America, and is both a house and a field mouse. It is between 3 and 4 inches long, with the tail about the same length; the feet are white, but the colour of the rest of the body varies considerably. It is nocturnal in its habits, nesting in trees, barns, and houses. Its nest is composed of moss and bark, but it sometimes occupies the deserted home of a squirrel or bird. It feeds on grain, seeds, and nuts, and is said to be very injurious to the farmer. The Rice-field Mouse (*Hesperomys palustris*) is more than 5 inches long and rat-like in form. It is abundant in the rice-fields of Carolina and Georgia, and does considerable damage. The American Harvest-mouse (*Ochetodon humilis*) is distinguished by its grooved upper incisors. It is about 2½ inches in length, and is found chiefly in grass lands. The larger species of *Murina* are noticed under **RAT**.

**MOUSE-BIRD.** See **COLY**.

**MOUTE-ORGAN.** See **PANDEAN PIPE**.

**MOUTHPIECE** (otherwise called *embouchure*), that part of a wind instrument which is put into or against the mouth. Even with instruments of a like kind, as, for example, the trumpet, horn, and trombone, the mouthpieces differ for each instrument. See **FRENCH HORN**.



**MOVEMENT**, in music, a detached and independent portion of a composition. Thus, the Pastoral Symphony of Beethoven consists of five movements—(1) a country scene; (2) the rivulet; (3) the village dance; (4) the storm; (5) *finale*, the shepherd's song.

**MOVEMENTS OF PLANTS.** The turning of plants towards light, the twining of tendrils and of plants like the hop, sensitiveness, and sleep in plants are well-known phenomena, which, with numerous other movements, were investigated by Darwin with his usual care in his work called "The Power of Movement in Plants." His observations show clearly that many of these movements may be considered as modifications of "circumnutation." A stem bows first, say, to the north, then it bends gradually towards the east, and so on to the south, west, and north again, by which circumnutation the apex describes irregular oval figures, often travelling in a zigzag line. The cause of the movement of a particular organ is the increased turgescence of the bladder-like cells on the convex side of the organ, followed by a like turgescence on the other side. This turgescence precedes growth, and therefore while turgescence, together with the extensibility of the cell-walls, is the primary cause of circumnutation, growth is a secondary effect. If there is an aggregation of small cells arrested in their development (called a *pulvinus*), then growth does not follow turgescence. Every part of a growing plant is circumnating day and night, and yet the movement is mostly very difficult to perceive. It only becomes perceptible after the lapse of time, or by the lines which a tiny bead at the end of a delicate glass thread attached to the organ traces out on smoked glass. Circumnutation begins even in the seedling. As soon as the tiny rootlet has pierced through the seed-cover it begins to describe a narrow ellipse, a movement modified by geotropism, or the tendency to turn towards the earth. The tip of the rootlet is the sensitive part, and it transmits the tendency to bend to the cells higher up. If the soil is soft, the tip enters easily, protected as it is by the root-cap; but if the surface is hard, the circumnating movement lifts the seed off the ground. This may cause it to fall into a crevice, where it can get a "purchase." But if not, a number of fine hairs are protruded from the upper part of the rootlet, which attach themselves to particles of earth or stone, thus anchoring the upper part, and aiding the root-tip to pierce the ground. The actual penetration is due to the forces of longitudinal and transverse growth. The former, according to Darwin's experiments, is equal to at least a quarter of a pound. To measure the transverse force, he grew the rootlets in holes cut in wood, and found the strain to be probably more than 8½ lbs. The rootlet thus acts like a powerful wedge driven slowly into a crevice and expanding simultaneously. The tip bends away from a hard object, and thus follow: "with unerring skill a line of the least resistance;" it also bends away from light and towards moisture. The seed-leaves (cotyledons) are also in constant motion, rising once and falling once in every twenty-four hours. Growing leaves also circumnate, rising a little at nightfall, and falling again on the following morning—a movement determined by the alternations of light and darkness. In climbing plants, like the hop, the "modified circumnutation" has become utilized for a special purpose.

The sleep of leaves consists of upward or downward movements, folding along the mid-rib, &c., the general result being either to protect the upper surfaces, by covering them one upon another, by crowding the leaves together, or by placing them vertically. Leaves pinned out so as to remain horizontal at night suffer much more from radiation than when placed vertically, and thus the plant protects itself from radiation. [See MIMOSA.] Darkness itself does not appear to be the stimulus, but the *difference* in the amount of light which they receive during the day and

night; for in several cases it appeared that if the leaves were not brightly illuminated during the day, they did not sleep at night, though there is an inherited tendency to move at the proper time. Heliotropism, or the turning towards that side which is most brightly illuminated, together with its modifications, are forms of circumnutation. Some seedlings are excessively sensitive to light; for instance, the seed-leaves of canary-seed (*Phalaris canariensis*) became curved towards a distant lamp, which emitted so little light that a pencil held vertically close to the plants did not cast any shadow, which the eye could perceive, on a piece of white card.

**MOVING POWERS.** The means employed to give motion to machinery (independently of the cases in which the force of gravity is applied directly, as in turning the cylinder of a clock) are the strength of men and animals, the pressure of the atmosphere, the expansive force of steam, electrical and magnetic attraction, gas and other inflammable agents used as explosives, and the action of wind or water.

The intensity of a moving power is always estimated by the amount of the resistance which is overcome, and the space through which the equivalent of that resistance is conveyed or raised vertically in a given time. Thus when a man, a horse, &c., conveys a certain weight, expressed in pounds, through a certain number of miles during a working day, the continued product of the weight, the distance, and the time denotes the intensity of the power, one pound being the unit of weight, one mile that of distance, and one hour that of time. In estimating, however, the power of an engine or machine, it is usual to consider one foot as the unit of distance and one minute as the unit of time, one pound being the unit of weight; the action of the power is moreover supposed to be continued during all the time that the machine is at work.

Originally the larger kind of engines, except such as were impelled by wind or water, were moved by the power of horses; and when other agents were employed, the gross effect of the engine was estimated by the number of horses, to whose action it was equivalent. A strong horse being able to draw 125 lbs. at the rate of 3 miles per hour during 8 hours, the product of these numbers, multiplied by the number of feet in a mile, and divided by the number of minutes in 8 hours, gives 33,000 lbs. for the weight carried or raised one foot per minute continually. This last number is the usual representation of the power of a horse. See HORSE-POWER.

In employing horses for the purpose of drawing on a road, it should be observed that the traces of the animal ought to be perpendicular to the collar on his breast and shoulders, so that when he leans forward, in pulling, the traces may be nearly parallel to the road; and the height of the wheels should be determined accordingly. When, in drawing a two-wheeled carriage, a horse has to overcome an obstacle on the ground, he lifts up his fore feet, and allows his weight to act upon his hinder feet as fulcrum, till the wheels have passed over the impediment. It follows that a certain portion of the loading in a cart should be thrown on the back of the horse, in order to increase the power which the animal employs in overcoming an obstacle.

When a horse is employed to turn a mill, the circle which he describes should be the greatest possible, say 25 or 30 feet in diameter, to diminish the centrifugal force, the danger of giddiness, and the necessity which the animal is under of reclining from a vertical position while moving round.

The force of steam engines is estimated according to the volume of water evaporated, the pressure of the steam, the length of the stroke, &c.

Wind and water are employed as prime movers by means of the momentum arising from their velocity; and the latter, occasionally, by the pressure arising from its weight. The force of wind is made to act on sails in giving motion to



vessels on the surface of water, and also in producing the revolutions of windmill sails. With respect to the power of an oar in giving motion to a vessel, it must evidently be proportional to the area of the blade of the oar under water, and to the square of the difference between the velocities of the oar and vessel, the former velocity being determined by the path, parallel to the keel, of the centre of percussion in the oar during a complete stroke. The power of the oar in rowing appears to be diminished by the reaction of the feet of the rowers in pressing against the foot-boards; this has a tendency to force the vessel backwards, but it is compensated by the greater velocity which the centre of percussion in the oar thereby acquires. To avoid this reaction racing boats now have sliding seats for the oarsmen.

The velocity of a vessel impelled by steam, in which paddle-wheels are employed, might easily be found if it were possible to determine, nearly, the number of square feet of paddle which, on both sides of the vessel, are at every moment acting efficiently against the water; the velocity of the wheel would be of course determined by the number of revolutions which the wheel makes in a given time; and it should be expressed by the number of feet per second which the centre of percussion in the paddle moves through in turning about the axle.

The momentum of water flowing horizontally against a plane, such as a float-board of an undershot wheel, depends on its velocity, on the area of the surface with which it comes in contact, and on the obliquity of that surface to the direction of its motion; and in estimating the effect of water on such a wheel, it is necessary to determine from the dimensions of the channel and the velocity of the water in it the weight of water which descends vertically through a certain height, as one foot, in a given time. The product of this weight multiplied by the height actually descended, being compared with the product of the number of pounds which the wheel can raise to a certain height in the same time multiplied by that height, expresses the ratio of the power to the effect.

The power of an overshot wheel is estimated by the product of the weight of water expended in a given time, multiplied by the whole height of its descent, that is, by the sum of the diameter of the wheel and the height of water in the reservoir above the top of the wheel. The useful effect of an overshot wheel is said to be as thirteen to five compared with one which is undershot. See HYDRAULICS.

The power of a breast-wheel is conceived to be equivalent to that of an undershot wheel whose head of water is equal to the difference in height between the surface of the water in the reservoir and the point at which the water impinges on the wheel, together with the effect of an overshot wheel whose height is equal to the difference between the point of impact and the level of the tail-water.

**MOXA**, a word of uncertain origin, signifying any substance whose gradual combustion on or near the skin is used for the relief or cure of disease. This method was early practised in the East, particularly by the Chinese and Japanese, from whom it was copied by the Portuguese; but having fallen into disuse, it was revived by the French surgeons during the Egyptian campaign. The substance employed by the Chinese is formed of the downy covering of the leaves of the *Artemisia moxa* (De Candolle); but the down of many other plants, or the pith, may be used. The stalk containing the pith of the Common Sunflower (*Helianthus annuus*) is a very convenient means, when the prepared moxas cannot be procured. Those used in Britain generally consist either of a pyramidal or cylindrical roll of linen, which is mostly steeped in a solution of nitrate or chlorate of potash. When they are used a wet rag is placed on the skin; in the centre of this is a hole in which the lighted moxa is placed, which gradually burns down to the skin and produces an eschar, which in due time separates by suppuration. The effects of the moxa

are less severe than the actual cautery and more powerful than blisters. The cases in which moxas have been recommended, when other counter-irritants have failed, are those of neuralgia and paralysis, but they are not very generally employed.

**MOZAMBIQUE**. The Mozambique Coast is that portion of the eastern coast of Africa which is situated between Cape Delgado on the north and Lorenzo Marques, on Delagoa Bay, on the south. It is on the western side of the wide strait by which the island of Madagascar is separated from the mainland of Africa, and which is called the Channel of Mozambique.

Mozambique is the principal of the Portuguese colonial possessions. The area of the territory actually under their nominal government is estimated at 200,000 square miles, and the population at 300,000. But the Portuguese authority is really inconsiderable. The surface is level near the coast, where the rich soil is well cultivated and yields excellent crops, but it is mountainous inland. The forests yield valuable ornamental woods. The climate is unhealthy in the low districts, but fine in the uplands. The ZAMBEZI is the principal river, and the coast is lined by shoals and by small coral islands. The products of the colony comprise wheat, maize, rice, manioc, sugar, coffee, indigo, numerous drugs, fine timber, ivory, rhinoceros' horns, hippopotamus' teeth, skins, oil, ambergris, gold dust, coal, and nitre. Gold and copper are found; there are plenty of turtles on the reefs, and pearl-fishing is profitably pursued. Formerly it supplied the slave markets of the whole world. The settlement of Mozambique is divided into nine districts, and placed under the government of a general, who lives in the capital, the town of MOZAMBIQUE.

The MOZAMBIQUE CHANNEL is 250 miles wide in the narrowest part. Its length, between 12° and 25° 45' S. lat., is about 1000 miles. Towards its northern extremity are the Comoro and Querimba Islands. Along the Madagascar shore there are several rocky islands, and a few small islands occur in the middle of the channel. The shores of Mozambique are all low. The depth of water is very considerable.

**MOZAMBIQUE**, the capital of the Portuguese possession of the same name, situated on Mozambique Island, which is about 1½ mile in length, low, and of coral formation, at the entrance of a deep inlet of the Mozambique Channel, called Mesaril Bay. This bay is 5½ miles wide and 6 long; and being also sheltered by two other (uninhabited) islands, San George and San Jago, forms an excellent harbour, each of the two entrances to which is defended by a fort. The town is capable of being rendered very strong. It contains large barracks, arsenal, storehouses, and wharves, and three churches, and is a penal settlement; but most of the dwellings are mere huts, and the streets narrow. It is the see of a bishop and the seat of a civil tribunal. The city occupies one-half of the island, and to the south of it is the Black Town, inhabited by coloured people.

The population, amounting to about 8500, consists of a small number of Portuguese, and a larger number of Canarens, an appellation given to the Creole Portuguese of Goa and the other Portuguese settlements in the East Indies. There is also a considerable number of Banians from Hindustan; but the free coloured people and the slaves, the latter numbering 7000, constitute the bulk of the population.

Mozambique was first visited by Vasco da Gama in 1498. The town was taken in 1506 by Tristão d'Acuña and Albuquerque, and it became the centre of the Portuguese possessions in those seas, and the seat of a viceroy, to whom all other governors in Africa were subordinate.

**MOZARAB**, a Christian living under the sway of the Arabs. The name was given by the Moors of Spain to all Christians living under Moslem jurisdiction in Cordova, Seville, Granada, Toledo, and other large cities. But the

word is better known to us as connected with the ancient liturgy of the Goths, the early history of which is unknown, but the groundwork of which is of the highest antiquity. Gregory VII. succeeded in suppressing its use, and in substituting the common Roman use in most of the Spanish churches and convents, and it was only saved from entire oblivion by Cardinal Ximenes of Toledo, who founded a chapel in Toledo in 1500 for its peculiar use. At this chapel the Mozarabic liturgy is still used, mass being celebrated there every day in accordance with the Mozarabic ritual.

**MOZART, LEOPOLD**, a musician, father of the illustrious composer, was born at Augsburg, 14th November, 1719, and died at Salzburg, 28th May, 1787. He was the youngest son of a bookbinder, who had married the widow of a member of his own trade; and his brothers being trained to the business of their father, he was taught music as a means of livelihood, and gained his subsistence for a while by playing the violin at dancing parties. He went to Salzburg, and there studied jurisprudence; but being unable to obtain any employment in this profession, he engaged himself as valet to Count von Thurn, in whose service he had opportunity to develop his musical talent. This was observed by the Prince-archbishop of Salzburg, who in 1743 appointed him one of his court musicians, subsequently gave him the office of principal violinist and composer in his chapel, and finally, in 1762, made him his vice-kapellmeister. In November, 1747, he married Maria Anna Pertlin, and the bridal pair were counted the handsomest couple in Salzburg. They had seven children, of whom only two survived their infancy. One of these, Maria Anna (the "Nannerl" to whom her brother addressed, under this pet name, countless loving letters), was born on 29th August, 1751, was the companion of her brother's early studies and first journeys, subsequently became a most esteemed pianoforte teacher at Salzburg, then married an officer of the court, at whose death she returned to her profession, and died at an advanced age, totally blind. Leopold Mozart's travels with his son are recounted in the notice of this master's career; he retained his engagement under a change of archbishops in 1772, but his new patron, wholly wanting in the liberal spirit of the first, complained so severely of his long absences from his duties, that he was obliged to forego the satisfaction of accompanying his son, and remain in the fulfilment of his office. He was a devout but quite unbigoted Roman Catholic; he considered the prodigious genius of his son to be a miraculous manifestation of the power of the Creator; and he felt it a religious duty to foster and develop this genius, and to bring it to the knowledge of the world. To his admirable technical training, and scarcely less to his excellent moral culture, may mainly be ascribed the transcendent greatness of his son, whose pre-eminent powers might, but for the father's care, have remained undeveloped; and this alone is enough to command for Leopold Mozart the veneration of all musicians. Leopold's services to the archbishop were ill paid, but very arduous. He had to write music for all public occasions in the cathedral, in the palace, and in the town. He was well esteemed as a violinist, and his instruction-book for his instrument, "*Versuch einer gründlichen Violinschule*" (often reprinted), is pronounced by most competent judges to be the best work for its purpose of the time when it was produced.

**MOZART, WOLFGANG AMADEUS**, probably the greatest of all musicians, was baptized *Johannes Chrysostomus Wolfgang Gottlieb*, named in his first publications *J. G. or Johann Gottlieb*, but always called in after-life as at the head of this article. His surname, *Mo'zart*, according to German pronunciation, is always called in England *Mozart*. He was born at Salzburg, 27th January, 1756, and died at Vienna, 5th December, 1791. His unparalleled musical organization was first manifested in the delight

with which he listened to his sister's practice on the harpsichord, and the pleasure he had in finding out the consonances on that instrument, in 1758. His father began in 1759 to teach him to play, his daily lessons varying from half an hour to an hour in length; and in 1760 he composed melodies, which his father wrote down from his dictation. His exquisite sensitiveness to quality of tone was evinced in his repugnance to the sound of brass instruments. Believing this to be a mere affectation, his father thought to dispel it by obliging him to listen to the notes of a trumpet; but the effect upon his nerves was so violent, that he would have fainted had not the performance been discontinued. Schachtner, the trumpeter in the chapel of the Archbishop of Salzburg, was an intimate friend of the Mozart family; his cheerful and genial nature seems to have supplied the single thing that was wanting in the character of Leopold Mozart to make him an all-sufficient companion for his son—the capability to become a child with him; and thus he, as his playmate, found, in sharing his games, fresh opportunity for admiring his genius. The urchin was despotic in requiring that music should form an element of every sport in which he engaged, and would not allow the archbishop's trumpeter to carry a toy across the room except he stepped in time and whistled a march the while; and he accompanied all his own motions throughout the game with improvised melodies appropriate to the action. So eager was the boy's yearning for affection that he would, many times in a day, ask his companions if they loved him, and would weep bitterly if in jest they made him a negative answer. In 1762 Leopold Mozart obtained leave of absence to travel with his two children for the exhibition of their talents, and he took them to Munich, where they played before the elector and were the astonishment of every one. Then, as always, Nannerl took more pleasure in the admiration excited by her brother than in the just praises bestowed upon her own performances. In the September of the same year the party went to Vienna. The court of the Emperor Francis I. was notable for musical taste, and the six-year-old performer was a pet both of the empress and the archduchesses, children like himself. Nannerl was presently attacked with scarlet fever, and Wolfgang caught it from her. On their recovery the father took them to Pressburg, where they won fresh applause, and returned with them to Vienna at the beginning of 1763. After a brief sojourn they went back to Salzburg. Wenzel, a friend of his father, at this time brought to the house some trios he had just finished for trial, and this seven-year-old stripling amazed them all by sustaining the second violin part at sight with complete efficiency.

A more extensive journey was undertaken in the July of this year (1763), when the elder Mozart started with his children, first to Munich, and thence, resting at each of the small courts on the route, to Paris. Wolfgang's facility in all kinds of musical exercise found everywhere fresh opportunity to prove itself; his almost instantaneous command of the pedals of an organ was matter of wonder to the ablest veterans, and his faculty of improvisation was incredible to any who did not test it. In November he reached the French capital, where he was idolized as he had been in Vienna; the Baron von Grimm introduced him at Versailles, and he was loaded with endearments by Queen Marie Antoinette and her ladies. At Paris his first publications appeared; they are two sets of two sonatas each, the first dedicated to the Queen of France. The father and children next came to England, where they arrived 10th April, 1764. Their reception was most cordial, and they found a good friend in Christian Bach, who, holding an appointment at court, had the means of introducing them to George III. In August, the father being ill, so that he could not bear the sound of the harpsichord, Wolfgang occupied himself with the composition of

his first symphony, of which his sister copied the orchestral parts as he finished the score, sheet by sheet, and this was played at his public concerts. Such wonder was excited by the precocious child, and such natural doubts were entertained of the verity of the stories related of him, that Danes Barrington, F.R.S., visited him for the purpose of putting his powers to the severest proof, and wrote a paper (printed in the *Philosophical Transactions of the Royal Society*) describing his marvellous passage through the ordeal. Among other tests he gave the boy a single word—such as “affetto,” “perfidio”—for the theme of a song, and was enchanted to hear him extemporize an aria full of expression, and truthful to the sentiment he proposed. A grand public concert took place on 13th May, 1765, at Hickford's Rooms, Brewer Street, Golden Square—announced as being “For the benefit of Miss Mozart of thirteen, and Master Mozart of eight years of age, prodigies of Nature. A concert of music, with all the overtures of this little boy's own composition.” The Mozarts left England in July; they then went through Artois and Flanders to Holland, remained some time at the Hague—where the Princess of Orange was a kind patron to the children, and where they were both laid up with another serious illness—and stayed at Amsterdam long enough for Wolfgang to write a symphony for performance at the installation of the stadtholder. After this they revisited Paris, and proceeded thence, through the chief towns of the south of France and Switzerland, back to their own country, arriving once more at Salzburg in May, 1766. The fame of Wolfgang's foreign successes had preceded him, and he was now regarded with peculiar interest by his townsmen. The archbishop was doubtful of the marvellous stories of the powers of the boy-composer, and, to verify his reputation, he set him to write a *miratorio*—probably of less than an hour in length, to form portion of some occasional church service; and to preclude his receiving any assistance in the labour he locked him up for a week in a chamber of the palace, allowing him to communicate with no one but the servant who brought him refreshment. Little Mozart completed the work within the period; and it was performed in the cathedral, to the equal delight of his taskmaster and astonishment of all who could best judge its merits. He now went through a course of study, under his father's assiduous direction, of the works of the great Italian contrapuntists and of the German composers who flourished before his own time, save only those of Sebastian Bach, with which he made no acquaintance until a later period.

In September, 1767, the family again visited Vienna. An attack of the small-pox not only disabled the children for a time from appearing in society, but was a fresh obstacle to their reception when they recovered. The Emperor Joseph II., however, no less kindly disposed towards the boy than was his father, thought to give him an opportunity of refuting all aspersions of his ability, by commanding him to write an Italian opera for performance at the imperial theatre. Young Mozart wrote “*La Finta Semplice*.” Endless stories are preserved of the cabals of the artists who were successful in preventing the performance of the work. At the same time, for the notorious Mesmer he wrote a German opera, “*Bastien und Bastienne*.” These two dramatic attempts are severally characteristic of the Italian and German styles of music; “*La Finta*” being based upon the Italian models of the day, and “*Bastien*” being utterly opposed to them in manner and expression. With all its vexations, the present was by no means a profitable sojourn to the Mozart family; and the father being required for the discharge of his duties at Salzburg, was obliged to return thither with his children at the end of 1768. Little Mozart received the appointment of concert-meister from the archbishop—equivalent to that of leader of the band, or principal violinist in England—which, however, he held without salary until the

beginning of 1772, when the annual stipend of one hundred and fifty gulden was granted to him.

In the last century, it was indispensable to a musician's acknowledgment by the world that he should visit Italy; accordingly, after a year's preparatory study, Wolfgang started with his father, at the end of 1769, upon a journey to the land in which the highest musical honours were to be won. His success in Milan, where he passed the first months of 1770, was such that, boy as he was, he received the commission to write an opera for performance during the ensuing carnival. At Bologna he was a candidate for membership of the Philharmonic Society, to obtain which he was required to undergo a most rigid examination, and to write an extremely elaborate exercise; and he not only gained his diploma with commendations almost unprecedented, but won the esteem of Padre Martini, the most learned contrapuntist of the age, which he accounted the greatest honour he could achieve. He subsequently submitted to a similar test, with like success, at Verona. At Bologna he made the acquaintance of Fuinelli, then living in princely retirement, whose conversations are supposed to have had due influence in maturing his exuberant feeling for dramatic expression. The celebration of Passion Week in Rome was an irresistible attraction to the pious Leopold Mozart, who went thither with his son to witness the solemnities of this occasion. It was then that Wolfgang performed the famous feat of transcribing from memory Allegri's “*Misere*,” the use of which had previously been restricted to the Pope's chapel, the singers being forbidden, under pain of excommunication, to carry copies of their several parts out of the sacred building. The effect of this music results far more from the manner of its performance than from its own merit; so much the greater was the difficulty of recollecting it, unmarked as it is by any prominent melodic, harmonic, or contrapuntal feature. Still, one hearing sufficed to enable the youth to write it out, and on listening to its repetition on the following day he so perfected his copy that, when it was subsequently compared with the original, there was not found the discrepancy of a single note between the two. At Naples, Mozart's improvisation and his harpsichord playing were ascribed to the effect of magic—natural science was not then a popular study in the south of Italy—and he was obliged to withdraw a ring from his finger, to prove that this was not a charm worn to give strength and agility to his left hand, for it was such as had never before been witnessed. Returning through Rome, he was there created a cavalier by the Pope, with the order of the Golden Spur—the same that had been conferred upon Gluck—but he never asserted his title out of Italy. He reached Milan again in October, that he might consult with the singers during the composition of his opera, “*Mitridate Re di Ponto*.” This was produced on the 26th of December, and had the extremely rare fortune of twenty successive representations. After visiting Venice and some other cities, father and son returned to Salzburg, in March, 1771; but Wolfgang was recalled to Milan, to compose (for the marriage festivities of the Archduke Ferdinand) “*Ascanio in Alba*”—an opera in extent and importance, though, from some nice distinction in the plan, classed as a *serenata*. Once more at Salzburg, Wolfgang wrote another *serenata*, “*Il Sogno di Scipione*,” for the installation of the new archbishop, 14th March, 1772. He again returned to Milan in October, probably taking with him the oratorio of “*Betulia Liberata*” for performance in Padua, the composition of which is assigned to this year. At Milan he wrote “*Lucio Silla*” for the carnival, and it was produced, 26th December, with still greater success than had attended “*Mitridate*.”

Mozart's brilliant career in Italy was succeeded by two years of quiet, but not of inaction, in his native town. In the course of 1773 he went with his father to Vienna, in hope that one or both might obtain some lucrative appoint-

ment; but, failing in this design, they made only a brief stay. As deputy for his father he had to furnish many pieces of more or less importance for the Cathedral of Salzburg; besides which he composed several symphonies at this period, and numerous detached songs, including the grand dramatic scene of "Andromeda." He wrote also, in 1774, the comic opera of "La Finta Giardiniera," a work described as presenting a great advance upon those he had written in Italy. He went with it to Munich, where it was produced on the 14th of January, 1775, with even greater applause than had greeted his previous works. Its success interested the Elector of Bavaria to hear a composition of Mozart in another style, and he commanded him, at a short notice, to write a motet for his chapel; this piece, in the severe contrapuntal school, the composer subsequently sent to Padre Martini at Bologna as an example of his progress. Mozart and his father were summoned back to Salzburg, to prepare for the reception of the Elector of Cologne, in honour of whose visit to the archbishop Wolfgang had to write a serenata, "Il Re Pastore," which, hurriedly as it was produced, appears to have highly merited its cordial reception. In the course of time he became impatient of his position in the petty town, which was no field for his powers; the archbishop he served, even more than his predecessor, wanted confidence in Mozart's talent; and many circumstances combined to render his life irksome to him, thirsting as he was for the distinction which he felt he only needed opportunity to gain. He asked therefore for another leave of absence, which was denied him; and he then besought his dismissal, which was granted. The tenacity of such a request gave great umbrage to his patron, and his father was involved in the disgrace at the archbishop's court which Wolfgang thus brought upon himself. The prudent Leopold, however, had the address to creep again into favour; but, forbidden to be his son's companion, he resigned this duty to his wife, enjoining that Wolfgang should acquaint him with the minutest details of what occurred in his progress, so that he might be enabled to advise him in every step of his career. In September, 1777, Mozart set forth as full of hope as of genius. This tour was not very successful, no appointment was to be had; but it formed his future life, for he fell in love at Mannheim with Aloysia Weber, the daughter of a poor music copyist and prompter, a girl of fifteen, possessing a remarkable voice and great talent for singing. Mozart conceived the wild scheme of travelling to Italy with the Webers, where he fancied Aloysia and himself would both find a career open to them; but his father desired him to break the connection and to go to Paris. Mozart was obedience itself to his father, and with a heart like a stone bade adieu to Aloysia and went. At Paris he had a more mortifying reception. Matters were disturbed politically; and it was, moreover, a finished artist, not a wonderful boy, who had returned. One, and one only advantage, Mozart derived from his disappointing sojourn at Paris—the experience of the great controversy between the German and Italian schools of dramatic music, conducted by the partisans of Gluck and Piccini, then raging at its height—an experience which must have made him sensitive to the merits of both, and which must have had a deep effect in perfecting his own views of dramatic art. The cathedral organist and the kapellmeister of Salzburg both died while Mozart was away; it was not without exercise of the diplomatic address which marked all his movements, that the father was able to obtain the present grant of the first office for his son, and the promise of the kapellmeistership, for which he was deemed too young, but which was to be reserved for him. Having gained these important points, he commanded Wolfgang's immediate return. Mozart's dislike to resume the old life of Salzburg was somewhat mitigated by the provision in his engagement that he should readily obtain leave of absence.

The Webers had removed to Munich, which was, of course, reason sufficient for his taking this city in his route; he wrote a grand aria for Aloysia, to display the specialities of her voice and style, and went to her, all confident in the warmth of his reception. When he entered the room, the fickle fair one feigned not to know him. Stung, but not cast down by this treatment, he went to the pianoforte and sang with careless accent, "I quit the girl gladly who cares not for me," and departed the house, leaving her a stranger to the undercurrent of his true emotions.

He reached Salzburg, and entered on his new duties there in January, 1779. During the next two years he wrote very extensively for the church, and composed also the opera of "Zaide," first published in 1838. With extreme joy he accepted a commission to write an opera for production on the elector's birthday, at Munich, on 29th January, 1781. This remarkable composition, an enormous advance upon all that had preceded it, was "Idomeneo," in which we have to admire the wonderful dramatic power and the first manifestation of the art of orchestral colouring, which owes its origin and its perfection to Mozart. It was completed with immense rapidity, rehearsed with enthusiasm, and produced with triumph. Mozart drew hopes from this success that his long unpropitious fortune might change, and he sent for some of his masses from Salzburg, and composed an offertory, a Kyrie, and a serenade for wind instruments, believing that such proofs of his readiness, appearing at a time when general opinion was favourable to him, might lead to his obtaining some appointment which would enable him to resign the one he held under the archbishop; but these hopes, like many others his sanguine temper had conjured up, waned in the reality of disappointment. He was obliged to leave Munich by an order to attend his patron at Vienna, where he arrived 16th March, 1781. Henceforth the Austrian capital was his abode. In the palace of the archbishop Mozart was compelled to dine with the cooks and lackeys, and when required to exercise his talent before the guests of his patron, was called upon as though this were the duty of a menial, instead of the function of an artist. Protests only producing insult, Mozart resigned his offices at the beginning of May. The Emperor Joseph had grown weary of the long succession of Italian operas that monopolized the court theatre, and desired such change as the setting of a German libretto might present. The novelty of the task was alone enough to make it seem difficult, but Mozart at once set to work on "Die Entführung aus dem Serail," and on 12th July, 1782, it was given with entire success. Mozart was now lodging with Mad. Weber—the mother of his faithless Aloysia—and found himself the subject of many kind attentions from all the family, especially from the second daughter Constanze. The accounts he sent his father of his new relationship with this family moved the worst apprehensions of the good old man; jealous as he was at any disrespect for his son, he had quailed under the rupture with the archbishop, for it had suspended all present hope of Wolfgang aiding him to liquidate some heavy liabilities at this time weighing upon him. Obedient to his father's counsel, Mozart left his lodging at Mad. Weber's, but he left his heart behind him, and he consequently married Constanze on the 4th of August, 1782. Aloysia had become the second wife of Lange the actor, and had gained a high position as a vocalist, and she now had all the advantage of Mozart's union with her family in his writing pieces for the display of her peculiarities; those detached arias, for example, which demand the free use of the exceptionally high notes of the extreme soprano register, were composed for her.

Prince Esterházy spent a few months of every winter in Vienna, whither Haydn accompanied him, whose acquaintance Mozart made on one of these occasions. They became the warmest friends, addressed each other as "thou"—which, under the excessive formality of manners then pre-

valent, was a privilege of affection permitted only to the nearest connections. Mozart commonly spoke of his great predecessor and successor by the title of Papa, and each acknowledged the deepest artistic obligations to the example of the other. Of a most vivacious temper, Mozart relieved his intervals of labour by the gayest enjoyment; he was passionately fond of dancing, and delighted still more in the personification of characters at the masquerades then greatly in vogue, but he suffered nothing to prevent his writing for a certain number of hours every day. From 9th February, 1784, till 15th November, 1791, he kept a register of every piece he wrote, inscribing therein the initial bars of each, with the date of its composition. His process of composition, which he was more than once led to avow, was, to perfect a piece, even to its minutest details, in his mind, before he committed a note to paper; and the almost total absence of erasures and corrections in his manuscripts, obviously corroborates his own account of his practice in writing. He was devoutly religious, but, as was the case with Haydn, his piety had a most cheerful influence upon him. Equal to his religious conviction was his enthusiastic zeal for freemasonry; he became a mason shortly after his settlement in Vienna, and prevailed upon his father also to procure admission to the St. Joseph's Lodge, of which he himself was a member, during the worthy Leopold's last visit to Vienna in 1785-86, for which occasion Mozart composed "Üeb' immer Treu," a standard masonic song in all the lodges on the Continent. Mozart when on a visit to his father at Salzburg in 1783 drew up the programme of a comic opera, "L'Oca del Cairo," the greater portion of the music of which he wrote after his return to Vienna; but the work, never completed, was not printed until 1860.

Passing over productions of minor extent, where none can be considered as of minor importance, we come to "Davide Penitente," an oratorio written for the annual concert in 1785 for the benefit of the widows of musicians in Vienna; and "Der Schauspiel-Director," an operetta for the display of the diverse singing of Mesdames Lange and Cavalieri, who divided the favours of the Viennese public, performed in the palace at Schönbrunn in February, 1786. This music, with additions from other works of Mozart, forms the operetta called "L'Impresario," concocted long after Mozart's death, with a new libretto written to match the songs. "Le Nozze di Figaro" was the next dramatic work that engaged him. Beaumarchais' comedy, then popular on every stage in Europe, was proposed as a subject by Mozart; the emperor had prohibited the representation of a German translation of the original piece, on account of its immoral tendency; satisfied, however, with the Italian version, and pleased with the music, he authorized the performance of the opera, and it was given 1st May, 1786, with immense applause. But the power of the jealous opposition to Mozart behind the curtain was so strong that the opera was performed but nine times during the first year, and it was not revived in Vienna until July, 1789. The characters of Susanna and Basilio were originally sustained by the English artists Anna Selina Storce and Michael Kelly, who were distinctly not in the cabals against the composer and his work. Mozart formed a warm friendship with them, as well as with Stephen Storce, then in Vienna with his sister; and upon their persuasion formed a design of coming to London, which, however, he did not fulfil. This design was prompted by the annoyances associated with the production of "Figaro." Mozart was dissatisfied with his position in Vienna as a pianist and teacher, and knowing his own claims to a different and a higher estimation than that in which he stood, he desired to locate himself where these claims would be recognized. The reproduction of "Figaro" at Prague, and its enthusiastic reception there throughout the entire winter, proved to him that he might find appreciation without the long journey proposed to him

by his English friends; and he accordingly visited the Bohemian capital in the spring of 1787. Never since he had ceased to be an infant wonder had he been so cordially welcomed as now; in private the highly cultivated dilettanti vied with the artists in acknowledgments of Mozart's genius. He seems never to have felt so happy as at this time, when he first knew himself to be thoroughly understood; and he joyfully accepted a commission to write an opera for the theatre. "Il Don Giovanni, ossia il Dissoluto punito" was here first performed, 29th October, 1787, and its reception was worthy of the work that was to stand at the head of all dramatic music. The story is well accredited of the overture having been written during the night prior to the production of the opera, while his wife mixed punch for him and told him fairy stories; and proves Mozart's strong aversion to the act of writing, which induced him to postpone till the latest moment the putting his ideas on paper; while it confirms the account, already given, of his habit of completing every composition in his mind before he wrote a note of it. The fame of this triumph preceded him to Vienna, and it may have been in consequence of so great an accession to his renown that the emperor gave him the appointment of chamber musician in December, which, however, carried but a salary of 800 florins. "Don Giovanni" was reproduced in Vienna 11th May, 1788. The multiplicity of his productions in the course of this year, each a masterpiece in the department of art to which it belongs, exceeds anything ever accomplished within the same time. Especially must be noticed the composition of the three symphonies in E flat, in G minor, and in C (named "Jupiter" in England), completed within the period of six weeks, between June and August; and these, which may be classed respectively as the loveliest, the most impassioned, and, if Beethoven be excepted, the grandest work in instrumental music, were not the only achievements of his genius during that brief interval. They were written, as were other of his symphonies, his concertos, and many of his detached arias, for his concerts. These consisted almost wholly of his own music, generally included a new composition, and always terminated with an extemporaneous performance.

Baron van Swieten, a distinguished lover of music, whose name is also conspicuous in the biographies of Haydn and Beethoven, was at this time enthusiastic for the introduction of Handel to the public of Vienna. He accordingly engaged Mozart to write additional orchestration, that should supply the place of the organ, for "Acis and Galatea," which was performed in November, 1788; for "Messiah," which was brought out in March, 1789; and for the "Ode for St. Cecilia's Day" and "Alexander's Feast," both of which were played in July, 1790. The treatment is admirable of all of these, but in the case of "Messiah" it is such an inspiration as betokens one of the happiest moments of a master, capable in every respect of making such descent upon the mighty original. After the production of "Messiah" Mozart accepted the invitation of Prince Lichnowsky (famous as Beethoven's patron) to accompany him to Prague, Dresden, Leipzig, and Berlin. Passing over his success in the other towns, his reception at Leipzig must particularly be noted, as also the rapture with which he examined some of the vocal compositions of Bach, which were shown to him at St. Thomas' Church, and with which he then first made acquaintance. At Berlin Frederick William II. gave him the kindest welcome, heard him play many times, and sought to attach him to his court as kapellmeister, with a salary of 3000 thalers. With some difficulty Mozart was persuaded by his friends to represent to the emperor the liberality of the Prussian king, in the hope thus to elicit a lucrative engagement in Vienna; but he was so little of a diplomatist that he returned from his imperial audience empty-handed as he went to it. It was by the emperor's command,

however, that he composed "*Così fan Tutte*," which was performed 26th January, 1790, when it met with much the same fortune as Mozart's previous Italian operas in the Austrian capital. The death of the Emperor Joseph and the succession of Leopold II. to the throne made a signal difference to the artists who had been favoured by the former, and Mozart seriously felt the change. The almost constant ill-health of his wife not only induced disorder in his domestic economy, but involved him in endless expenses that were far beyond his ability to meet, and thus caused him a twofold, never-ceasing anxiety. Hoping so to be relieved from his pecuniary embarrassment, he applied for the offices of instructor to the imperial princes and second kapellmeister, and was refused them both. Subsequently, however, he obtained the appointment of organist to St. Stephen's Cathedral, but too late for him to derive benefit from its emolument. His cares so preyed upon his spirits as to stifle his creative power. He went to Frankfurt at the time of the new emperor's coronation there in October, thinking that the general excitement might conduce to the success of a concert, at which, however, he gained nothing but admiration; and he won no more solid advantage at either Mannheim or Munich, which he visited on his way home. At the beginning of 1791 Salaman, the violinist, proposed to Mozart and Haydn to come to London to compose for the professional concerts which he directed; and it was arranged between the three that Haydn, because of his more advanced age, should first visit this country, and that Mozart should succeed him in the following year. Bitter was Haydn's grief when he here received the sad tidings that told of the frustration of this arrangement.

The time arrived which was to close the season of Mozart's comparative inactivity. Some Hungarian noblemen now subscribed to allow him a pension of 1000 florins, on condition that he supplied them annually with a certain number of compositions; and this he felt to be the dawning of a better fortune to him than he had ever enjoyed, since it would secure him from want and insure him appreciation of his works. In July, 1791, Schikaneder, manager of the Theater an der Wien, in which he was also an actor, besought him to compose a German opera; and that he might the more control him in the conduct of the work, prevailed on him to reside with him while engaged upon it. The society Schikaneder kept, and his manner of life, were extremely licentious; and Mozart's temporary abode in such questionable quarters gave rise to the otherwise groundless statements of his dissipated habits. The opera composed under these circumstances was "*Die Zauberflöte*;" the design of the libretto was to symbolize the principles and customs of freemasonry, and this gave the task of its production a peculiar interest to Mozart, whose attachment to the order was, as has been shown, like a second religion in him. On the other hand the manager-actor was despotie in respect of all the music of the part of Papageno, to be sustained by himself, which he insisted should be in the lightest possible style; and he compelled the yielding composer to rewrite several of the pieces many times before he was satisfied of their simplicity. This opera was still in progress when Mozart was visited by the intendant of Count Walsegg, a nobleman who desired the reputation of being a composer; the count's wife had died, and he wished to be supposed to write a Requiem for her, and sent to commission Mozart with the composition, stipulating that he should resign the credit of its authorship to himself. The visit of the count's agent was attended with circumstances of great mystery. Mozart's anxieties had strongly predisposed him to the infection of an epidemic then prevalent, from which he was slightly suffering. This added to the depression of his spirits, which was the natural reaction of the over-excitement of his life at Schikaneder's; his imagination thus disturbed, he regarded the proposed commission as a preternatural

warning, and he undertook it with the presentiment that the Requiem he was to write would be for his own obsequies. So deeply interested was he in this new task, that he entered upon it while he was still busy with the "*Zauberflöte*," and the solemn earnestness with which he regarded it is amply evidenced in the character of the two first movements. When these were finished he had to lay both the opera and the Requiem aside, being invited by the state authorities of Prague to compose a work to celebrate the coronation of the emperor there as King of Bohemia. The happy recollection of his success in that city gave an irresistible charm to the invitation, and he undertook to write the opera of "*La Clemenza di Tito*," though there were but eighteen days for the accomplishment of the labour. He was met by Count Walsegg's agent as he was setting out for Prague, who pressed him to complete the Requiem, and this inopportune urgency strengthened his foreboding of his own fate being connected with that composition. He worked at the "*Clemenza*" in his travelling carriage, so brief was the time for its completion; and he entrusted the composition of the parlante recitatives throughout the opera to his pupil Süssmayer, who also wrote one small duet for it. On the 6th of September the work was performed, but it did not excite the enthusiasm which had greeted "*Figaro*" and "*Don Giovanni*" in the same place; and this added to the despondency which had been daily increasing in the composer. He returned to Vienna, finished his "*Zauberflöte*," and directed its first performance on the 30th September, when it was indifferently received. It grew in public favour, however, upon repetition, soon became very attractive, and was before the end of a year popular throughout Germany. Mozart now resumed the Requiem, to which his too truthful presentiment more and more inclined him; and he was especially delighted to be able to write down the "*Recordare*," in which movement he felt he had put forth the best he could produce. His illness increased so rapidly that his physician forbade him to write, and ordered his score to be kept from him; but a transient improvement in his condition induced the relaxation of this injunction, and when once allowed to return to his work he never again suffered his thoughts to wander from it. Süssmayer was continually with him, to whom he anxiously explained the effects he designed throughout the composition. So entirely was his mind concentrated upon this death song, that in his last moments he assembled three singers by his bed-side, and with them, himself bearing the alto part, attempted a performance of the work; but his strength failed him before it was half concluded, and breaking down in the movement that begins "*Lacrymosa*," he was forced to discontinue it. Feeling the hand of death upon him, he begged that the event might be kept secret until his friend Albrechtsberger could apply for the organistship at St. Stephens, which this would render vacant. Mozart was interred on the day following his decease, amid the fierce raging of a wintry storm. Thus none but the officials were present at the ceremony, and when his widow afterwards inquired where the remains of the greatest of musicians had been laid, a new sexton had been appointed in the interim, and there was no one who could direct her to the spot. This sacred place, which would have attracted the pilgrim steps of all art-lovers, has never been discovered.

Such was the too cruel end of one of the gayest, brightest, most generous, most happy-making, and most universally loving of men, whose heart was as large as his intelligence, and whose genius comprehended everything within the wide range of music. His personal character has been much traduced; but the careful and accurate researches into the circumstances of his career that have recently been made by Jahn and others, entirely free it from every stain, save only the one foible of improvidence. He had

six children, of whom two survived him. The elder filled some government office for many years at Milan. The younger, Wolfgang Amadeus, was born on the 26th of July, in the year of his father's death; trained to his father's profession under the friendly care of Haydn, Neukomm, Streicher, and Albrechtsberger, he came before the public as a composer and a pianist, and lived chiefly at Lemberg, little distinguished but by the name he inherited. The enormous amount of Mozart's productions in every department of music—for the church, for the theatre, for the concert-room, and for the chamber—in the very brief term of his life, is truly amazing; and when we consider how much of his time was occupied in playing and teaching, and how much also in amusement, we should be unable to credit this prodigious fertility had we not the evidence of the works themselves to convince us. This is best proved by figures. Breitkopf and Härtel have published complete editions of most of the great composers. Their splendid Mozart edition, finished in 1883, runs to 13,000 pages, exclusive of the large supplement of fragments, among which are important works like the Requiem. This mass of music is comprised in 528 separate numbers, grouped in twenty-three series; whereas Beethoven's works are published by the same firm in 263 numbers, and Mendelssohn's in 157. Over a third of Mozart's music was first published in this great edition. It is not, however, by the number, but by the excellence of his compositions, that this master advanced his art. How much is due to him of the unfolding of the principles of musical construction is best proved by a comparison of the works of Haydn that were written before this great master knew the productions of Mozart with those that were composed after he had watched the grand development of his own design in the labours of the man who was both his pupil and his teacher. The art of instrumentation, which is in music what colouring is in painting, owes to Mozart its birth and its perfection. Before his time, composers wrote for few instruments or for many, according as they intended their music to be soft or loud, but often with little consideration of the various qualities of tone of the different elements of the orchestra. It is, however, in the department of the opera that music is most indebted to Mozart for its progress. With the nicest sense of dramatic propriety he always controlled the arrangement of his librettos, and thus we may ascribe to him the perfecting of the *finale*, first exemplified in "Figaro," and afterwards in "Don Giovanni" and "Cosi fan Tutte"—namely, a culminating portion of the action in which all the characters are opposed, set to a continuous piece of music that extends over several movements, and exhibits in relief and in union the chief elements of the drama. This is the grandest achievement in dramatic music, and this it which advances the opera into the foremost grade of composition.

A notice of Mozart would be incomplete which gave no account of the disputes as to his authorship of the Requiem. That his wife, a practical musician, who was by his side all the time he wrought at this work, should have been totally ignorant of the subject, is lamentable, not to say culpable in the last degree. She could only state that she committed to Süßmayer, without examination, all the scraps and sketches that were found at Mozart's death, which he had made, contrary to his usual practice, in consequence of being prevented by his illness from completing each piece before he began to write it. Subsequently, Süßmayer handed her a copy of the work, of which some portions were written in Mozart's hand and some in his own; and he forwarded another copy to Count Walsegg. The emperor, on learning that she was left in pecuniary difficulties, gave her a pension for life, and granted her the use of the court opera-house for a benefit concert, at which all the artists assisted gratuitously, and at which the Requiem

was performed. The great interest it excited on this occasion induced many applications to her for transcripts of the score, and the work was publicly given at Leipzig and other places. The count's pretensions to the authorship were of course negated by this production of the Requiem as Mozart's last composition; but he took no steps to bring the widow to account for her breach of contract until the work was printed, when he instituted legal proceedings against her, which, however, he suppressed at the solicitation of Baron von Nissen (her second husband) and Abbé Stadler. In 1799 Breitkopf and Härtel purchased the right of publication from the widow, and printed the Requiem. Disputes then arising about its authenticity, Süßmayer wrote a letter to the public journals in 1801, declaring that he was the author of those portions of the MS. he had handed to the widow which were in his handwriting. This startling assertion excited little notice at the time; but in 1825, Gottfried Weber made it the groundwork of an assumption, that Mozart's claim to the Requiem was entirely spurious, and this gave rise to a violent dispute, in which the chief critics of the day were engaged. The widow sold to André the right of publishing another edition of the work, in which are defined, by their respective initials, what portions of the MS. are in the hand of Mozart and what of Süßmayer. If this be final we must admit that Mozart completed the first two movements, and wrote the voice and bass parts up to the beginning of the "Lacrymosa;" and that Süßmayer made up the rest of the work, partly from Mozart's fragmentary sketches, partly from having heard him play finished but unwritten movements; and finally, from the minute description of his intentions, which it was the last care of the dying master to impart to him. The strange treatment of the trombones in the "Benedictus" warrants the belief that some one other than Mozart was concerned in the instrumentation, and upon this clumsiness rests Süßmayer's best pretensions. If there be any truth in intrinsic evidence, however, we may be well satisfied that practically the entire composition proceeded from the one only mind that could have conceived it, though some portion of the mechanical act of transcription may have been executed by another hand. All other accounts of Mozart's life and career were superseded by the magnificent work of Otto Jahn, which first appeared in 1856, and was practically rewritten for the second edition, of 1867. The long-felt want of a good English translation was supplied in 1883.

**MUCIC ACID**, an acid isomeric with saccharic acid, obtained by the oxidation of lactic or gum-arabic by dilute nitric acid. The formula is  $C_6H_{10}O_8$ . It crystallizes in colourless tables; it is insoluble in alcohol, but very soluble in boiling water, from which it crystallizes on cooling, being little soluble in cold water. It dissolves in sulphuric acid with deep crimson colour, which is characteristic. It melts when heated, and on further heating is decomposed into pyromucic acid ( $C_6H_4O_8$ ) and carbonic acid. By oxidation with nitric acid it yields racemic and oxalic acids. It is dibasic, yielding both neutral and acid salts, called mucates; those of the alkalies, as the mucate of potassium ( $2C_6H_4K_2O_8.H_2O$ ), are crystalline. Several mucic ethers are known. Mucate of ethyl ( $C_{10}H_{18}O_8$ ), or mucic ether, crystallizes in four-sided prisms. It is soluble in hot alcohol and hot water, but insoluble in ether. By the action of ammonia it is converted into mucamido ( $C_6H_{12}N_2O_8$ ).

**MUCIUS SCAEVOLE**. See SCAEVOLE.

**MUCK, RUNNING A**, a phrase derived from the Javan word *amok*, to kill, used to describe any indiscriminate attack made under the influence of blind fury. It is found that prolonged misery or the influence of any of the powerfully depressing emotions such as lead to suicide among Europeans, are apt among the Malayan races to develop into wild outbursts of homicidal frenzy. At such times a



man will stimulate himself with a strong dose of opium, and then raising the cry of *amok, amok!* savagely attack every one he meets. The cry is at once taken up by the bystanders, and the man is hunted down and killed like a mad dog, though he usually manages to do a good deal of mischief before he is slain.

**MUCUNA**, a genus of plants belonging to the order LEGUMINOSÆ. The species are climbing herbs or shrubs, with pinnately trifoliate leaves and axillary racemes, which hang down when bearing fruit. *Mucuna pruriens* (cowhage) has pods covered all over with a thick coating of erect, white, stinging hairs, which turn black in drying and brown when ripe. It is a native of the hedges and banks of the East Indies. *Mucuna pruriens* (common or stinging cowhage) likewise has pods about 3 inches long, the thickness of the finger, closely covered with strong brown stinging hairs. See COWHAGE.

**MUCUS**, the fluid substance on the surface of *mucous membranes*. By the contact of the foreign matters to which all the mucous membranes are exposed in the performance of their functions, or by other processes, the epithelium cells which cover their surface are constantly being removed, and their place is as constantly supplied by the formation of new cells from the surface beneath. Thus on all the mucous surfaces a more or less rapid process of desquamation and reproduction of cuticle is ever going on; the superficial layers scaling off, and deep layers being produced in a manner exactly similar to that in which, as the outer surface of the cuticle of the skin (the epidermis) is removed, fresh layers are deposited on the inner surface to replace them and maintain the thickness of the membrane.

The superficial layer of epithelium cells thus removed, not in dry scales, like the epidermis, but mixed with a quantity of watery fluid secreted by the surface of the mucous membrane, constitutes healthy mucus—a viscid, ropy, transparent, and apparently homogeneous substance, which is distinguished more especially by the presence of minute epithelium cells either floating separately or united into small membranous flocculi. Its chief chemical properties are that it mixes with any quantity of water without being dissolved, but swells up and forms flocculi; that it does not dissolve in alcohol, and is not coagulated by heat. It is subject to various alterations by disease.

**MUD VOLCANOES** are apertures in the earth in volcanic districts, from which mud is periodically ejected by gas or steam. The mud accumulating round the mouth forms true cones, sometimes upwards of 80 feet in height.

**MU'DAR.** See CALOTROPIS.

**MUDSTONE** is a fine-grained homogeneous rock without true fissile character, but breaking up into small angular fragments, and on further disintegration with water forming clay and mud. Some varieties are more or less sandy, while others are almost wholly argillaceous, and evidently formed from the decomposition of felspars and allied minerals. Mud, when indurated, forms marl, shale, or slate.

**MUEZZIN**, in Mohammedan countries, is the general appellation of those officers of the mosques whose duty it is to proclaim the invitation to prayers at the five canonical hours, namely, at dawn, at noon, at four o'clock in the afternoon, at sunset, and at nightfall. The muezzin cry is a substitute for bells, which are not used in Mohammedan countries. On hearing the muezzin's call the devout Moslem prays, with his face towards Mecca.

**MUFFAT, GEORG** (1640–1704), an excellent early musician, was, as we are informed in a preface to his collected works, a pupil of the great Lully at Paris. He then became organist of Strasburg Cathedral, whence he was driven by the city's capture by Louis XIV.; and after residing at Vienna and Rome finished his career as musical director first of the Archbishop of Salzburg, and lastly of the Bishop of Passau. He wrote much for the limited string orchestra of the period and for the organ.

**AUGUST GOTTLIEB MUFFAT**, his son (1690–1770), was a pupil of the renowned contrapuntist, Fux, and became court organist to the Emperor Charles VI., father of Maria Theresa, to whom he taught music. He wrote principally for the organ, and with great taste. Handel, it is alleged, plundered subjects from him for his oratorios. The younger Muffat is often called *Theophilus* (a translation of Gottlieb). Dr. Rimbault, in his "History of the Piano-forte," gives an air of Theophilus Muffat, wherein is clearly the germ of the famous march in "Judas Maccabæus."

**MUFTI**, the general denomination of the head doctors of the law of the Koran in Turkey, of whom there is one in every large town. The mufti of Constantinople is the highest in rank, and has a jurisdiction over the muftis of the provinces. He is styled Sheikh ul Islam, or "chief of the elect," and is consulted in important matters of law. Formerly an office of great dignity and importance it is now granted or withdrawn at the pleasure of the sultan, and the grand mufti in consequence exercises but little independent authority. His *fatwa* or decision, however, is still appended to the imperial decrees, and he is always consulted in reference to the making of war or conclusion of peace.

**MUGGLETONIANS**, the name given to a small sect founded in England about the middle of the seventeenth century by two tailors named John Reeves and Lodowick Muggleton. The latter, the son of a farrier, was born in Bishopsgate Street, London, about 1610. He was apprenticed to a tailor, and practised this trade for the remainder of his life, but about 1651 he professed to receive special divine revelations by a "motional voice." A brother tailor, John Reeves, also professed to have a similar experience, and the two men announced themselves to be the two witnesses spoken of in the book of the Revelation. It was a time of much religious excitement and fanaticism, and they soon obtained a following, an exposition of their doctrines being published in 1656, under the title of "The Divine Looking-glass." The most prominent feature in their utterances was the doctrine of their own prophetic character and authority, unbelievers being freely threatened with everlasting punishment; but they also taught that the distinction of persons in the Trinity is merely nominal, that God has a real human body, and that he left Elijah as his viceregent in heaven when he descended to earth to die on the cross. Reeves died in 1658, and in 1676 Muggleton was tried at the Old Bailey, and convicted of heresy. He survived, however, until 1698, and a belief in his mission was preserved until nearly the middle of the present century. His collected works were published in 1756, and as late as 1832 some sixty Muggletonians subscribed to reprint and publish them in three vols. 4to. "The Divine Looking-glass" was reprinted as late as 1846, but the sect does not appear in the census of 1851, and it is now wholly extinct. William Penn's book, "The New Witnesses proved Old Heretics" (1672), was directed against the Muggletonians. "The Acts of the Witnesses," an autobiographical work of Muggleton, is said to be rather amusing reading, from its blending of the highest spiritual pretensions with the most prosaic details of the life of a London tailor of the seventeenth century.

**MULATTO**, a term commonly applied to distinguish the children of a union between a white and a negro, and in Spain to persons having an admixture of Moorish blood. The American mulatto is of a deep tawny or yellow colour, with frizzled or woolly hair, and resembles the European rather than the African. In the West Indies, the offspring of a white and a mulatto is called a *quadroon*, or one-quarter black; of a white and quadroon, a *mustee*, or one-eighth black; of a white and a mustee, a *mustafina*, or one-sixteenth black; after which they are considered *white-washed*, or Europeans. The child of a mulatto and a negro is called a *cabre*; of a cabre and a negro, a *griffe*;



and after this they go back to the pure negro. Spanish pride, however, has introduced many more distinctions than these to mark the exact admixture of white blood; such as zumbi, quatravili, tresavili, saltatrus, coyote, zambaigi, can-busos, jiveros, puchuelas, &c.

**MULBERRY** (Ger. *Maulbeere*). The black or common mulberry is the fruit of *Morus nigra*, the only species of *Morus* worthy of being cultivated as a fruit tree. It is probably a native of the country south of the Caucasus and the Caspian. Its introduction to this country dates about the middle of the sixteenth century. Under great vicissitudes it proves very tenacious of life; and under ordinary circumstances it attains, even in this climate, a considerable age, for some trees planted in 1518 are still alive.

As the acquisition of a good mulberry-tree is very desirable, the following directions for obtaining a bearing tree readily and quickly will be useful. If a tolerably large branch of a vigorous tree be "ringed," and the annulation be inclosed in a box filled with rich soil, sufficiently large to hold as much as will preserve a somewhat uniform temperature, or at least an approximation to that which the roots of a tree naturally experience in the ground, roots will be readily emitted into the earth, and in due time the branch may be cut off and planted. A covering of moss is useful, partly for maintaining an equable temperature, and partly for preserving moisture.

The mulberry-tree requires very little pruning beyond that of regulating the head. The season for this operation should be always mid-winter; for, if in a growing state, this plant bears amputation very ill, especially as regards large limbs.

The fruit (popularly but incorrectly termed a berry) of *Morus nigra* is used in medicine. It contains much mucilage, with an astringent resin, and is sweetish and subacid, owing to the presence of some malic or tartaric acid. As the cooling properties depend on the acid, the fruit for this purpose should be gathered before it is quite ripe. It may either be formed into a syrup, or a vinegar may be made with it similar to raspberry vinegar, which constitutes an excellent gargle in inflammatory sore throat, and a drink in slight febrile affections.

The White Mulberry (*Morus alba*) is a native of China, where it forms a small tree, and whence it has been gradually carried westward, till it has become a common plant in most of the temperate parts of the Old World, forming in the south of Europe a pollard-tree by roadsides. It is on this species that the silkworm is chiefly fed; and in silk countries many varieties are cultivated for the purpose, some of which are said to be much better than others. Some years since a mulberry was introduced into France from Manila, whence it has gained the name of the Philippine Mulberry, the great excellence of which seems universally acknowledged. It grows much faster than the white mulberry, and strikes from cuttings as freely as a willow, which is not the case with the white mulberry. The abundance of its leaves is much greater than any other known variety, and it is not only freely eaten by the silkworms, but perfectly agrees with them. Its culture is now superseding that of all others in the south of Europe, and it is even taken as a stock on which to graft the common white mulberry, when the latter is wished for. The so-called paper mulberry, whose inner bark is woven into a material for the dress of the Chinese and Polynesians, is the *Broussonetia papyrifera*.

**MULE.** This word is often applied to the offspring of any two animals of distinct species, and is then synonymous with the term *HYBRID*; but is especially and most generally applied to the offspring of the male ass and the mare. In height and shape the mule resembles the horse; but the head, croup, tail, and long ears, recall rather its sire. It is remarkable for endurance and surefootedness, and

has more strength and vigour than the ass. The coat is usually brown. It neither brays like an ass nor neighs like a horse, but utters a feeble hoarse sound. As a beast of burden the mule is unrivalled. It has been bred from very ancient times, and used for riding and yoked to chariots and carriages; in Spain at the present day it is extensively employed for carriages. For military purposes its usefulness as a transport animal has been demonstrated in all the recent campaigns. Mules are bred in large numbers in France, Spain, Italy, India, and many parts of Asia and North and South America. They are seldom bred in the United Kingdom, and but little used.

**MULE DEER** (*Cervus macrotis*) is an American species of deer belonging to the same genus as the Virginian deer. The mule deer is larger than the Virginian deer, and of a heavier build, sometimes attaining a weight of 250 lbs. The name refers to the long, broad, and thick ears, which are well covered with hair, and, in the female especially, resemble greatly those of a donkey or mule. The antlers are large, and borne only by the male. The general colour of the hair above is brownish-gray; the under surface is grayish-white, and the tail pale yellow, with a black tuft at the tip. The mule deer is shy and difficult of approach; it is found on both sides of the Rocky Mountains, and extends eastwards into the prairies of Missouri.

**MÜLHAUSEN** (Fr. *Mulhouse*), a large manufacturing town of Germany, in the province of Alsace, formerly in the French department of Haut-Rhin, and which, with the communes of Illzach and Modentzheim, though entirely surrounded by France, was a member of the Swiss Confederation till 1793, when it voted its annexation to France, with which it was incorporated by treaty in 1798. The town was included in the territory ceded to Germany after the war of 1870-71, and is now the chief place of the district of Oberelsass. It is situated on the Ill, a feeder of the Rhine, at a distance by railway of 27 miles south from Colmar, 18 north-west from Basel, and had 63,629 inhabitants in 1880. Mühlhausen is divided into an old and a new town; the former on an island in the river, which is here crossed by several bridges, comprising Catholic churches, a Protestant church, a Jews' synagogue, town-hall, communal college, and hospital; while the latter, extending along the right bank of the river, has a square, containing the exchange and the chamber of commerce. Mühlhausen is the chief manufacturing town of Alsace, and has obtained deserved celebrity for its printed cottons. The other manufactures are cotton and woollen yarn, muslin, silk, woollen cloth, hosiery, straw hats, morocco leather, soap, damask, linen thread, &c. There are dye-houses, tanyards, metal foundries, and large establishments for making steam machinery. There is also a large trade in corn, wine, brandy, groceries, hardware. A chief feature of Mühlhausen is the district known as the "workmen's city," which was established for the purpose of providing each workman and his family with a good separate residence. Its numerous tall chimneys give Mühlhausen the appearance of a miniature Manchester. The canal which unites the Rhine to the Rhine passes by the town, and there is also good railway accommodation.

**MULL**, an island on the western coast of Scotland, and the third largest of the Hebrides, included in Argyllshire. Its length, from north to south, is 30 miles, and the greatest width, east to west, is 21. It is separated on the north-east from the mainland by a narrow strait called the Sound of Mull. Area, 301 square miles. The coast is indented by numerous lochs and bays. The substance of the island is principally trap rock. The highest mountain, called Benmore, is 3185 feet in height.

The interior of Mull is trackless, repulsive, and dreary. The soil, where the surface is not covered with crags, heath, or swampy morasses, consists of loam and clay,

and is fertile. Oats, barley, and potatoes are cultivated. The breeding of sheep and black cattle is the chief industry. Mull is the seat of a presbytery. The population of the island in 1881 was 5229. Tobermory is the only town.

**MULL, SOUND OF**, a tortuous and most picturesque channel, seldom more than 2 miles wide and 18 in length, divides Mull from the Morven district of the county of Argyll, and connects Loch Linnhe to Loch Sunart.

**MULL**, in Scottish, a snuff-box made of the small end of a horn; also a term used almost synonymously with *cape*, as the Mull of Galloway, the Mull of Cantire, &c.

**MUL'LET** is a name applied to fishes of two different families. The mullets proper or gray mullets, with which the present article will deal, belong to the family Mugilidæ, of the order Acanthopterygii, and are most nearly allied to the families Atherinidæ and Sphyrenidæ. The red mullets, or **SURMULLETS**, form the family Mullidæ, which finds its nearest ally in the perches (Percidæ).

The gray mullets have a nearly cylindrical body, covered with cycloid scales of moderate size. There are two short dorsals, widely apart from each other, the first being composed of four stiff spines. The head is flattened, the eyes large and wide apart, the mouth narrow, and the teeth either absent, as in Mugil, or exceedingly fine. About seventy species of mullets are known. Most are marine, inhabiting the coasts of the temperate and tropical zones, but entering the brackish waters of the mouths of rivers; a few tropical species live exclusively in fresh waters. The Common or Gray Mullet (*Mugil capito*) is common on the south English coasts, and is found in the Mediterranean and along the western coasts of Southern Europe. In length it is usually about 15 inches, but sometimes reaches 2 feet. The top of the head and back are dusky gray, tinged with blue; the sides and belly are silvery white, marked with longitudinal parallel dusky lines. The gray mullet keeps close to the shores, and often ascends rivers. Its food consists of soft or decaying animal or vegetable matters, which it swallows mixed with mud or sand, the pharynx being modified into a kind of filter in order to prevent large hard substances passing into the stomach. A portion of the stomach forms a gizzard like that of birds. Gray mullets have been kept with much success in fresh-water ponds. Their flesh is wholesome, and esteemed for the table. Several other species of mullets occur on British coasts. *Mugil cephalus*, a native of the Mediterranean, is larger than the preceding species, and is the most esteemed for food. Two other genera of Mugilidæ are distinguished *Agonostoma* and *Myxus*.

**MUL'IDÆ**. See **SURMULLETS**.

**MULLINGAR**, a town of Ireland, in the county of Westmeath, of which it is the capital, connected with Dublin, 46 miles E.N.E., and with the Shannon by the Brosna and the Royal Canal, on the line of the Great Midland Western Railway. It is well built, and has the usual buildings of a county town, a convent, barracks, good schools, &c. There are tanneries, breweries, and woollen mills. Population in 1881, 4787.

Mullingar, though modern in appearance, is an ancient palatinate town, and has frequently been the headquarters for military operations. It was the centre of some important ones before the siege of Athlone by William III.'s forces.

**MUL'LION**, a term in Gothic architecture applied to the upright bars, or stone shafts, dividing the general aperture of a window into secondary openings, which are again frequently subdivided vertically by a similar shaft crossing the mullions horizontally, and therefore called a *transom*; whereby the whole space beneath the head of a window (supposing it to be an arched one) is formed into a series of panels in which the glass is fixed, and which are sometimes technically distinguished as *lights*. For instance,

the great window in the west façade of York Cathedral is divided into eight lights or compartments by seven mullions, while that at the end of Westminster Hall has eight mullions and thrice three lights.

**MULREADY, WILLIAM, R.A.**, was born in 1786, at Ennis in Ireland. At the age of fourteen he was admitted as a student into the Royal Academy, London, and soon attracted attention by his sketches of domestic life and familiar subjects. In 1812 appeared his "Punch," and in 1815, "Idle Boys," which procured him election as A.R.A., and three months later the crowning honour of R.A. A considerable advance as an artist was noticeable in his "Wolf and Lamb," in 1828. In 1837 he illustrated the "Seven Ages" of Shakspeare; and in 1840 made a series of twenty-four exquisite drawings of subjects taken from the "Vicar of Wakefield." They must be pronounced the artist's *chef-d'œuvre*. Mulready continued to labour to the last, his latest and finest works being "The Butt," "Women Bathing," and the "Toy-Seller." He died, full of years and honours, on 17th July, 1863.

**MULTAN'** (*Mooltan*), a municipal city and the administrative headquarters of Multan District, Punjab, British India, is situated 4 miles from the present left bank of the Chenab, and is inclosed on three sides by a wall from 10 to 20 feet in height, but open towards the south, where the dry bed of the old Ravi intervenes between the town and citadel. The fortifications were dismantled in 1854, but the fort still remains a place of considerable strength, occupied by a European garrison. Large and irregular suburbs have grown up outside the wall since the annexation in 1849. Within the city proper, narrow and tortuous streets, often ending in *culs-de-sac*, fill almost the whole space; but one broad bazaar (constructed by the British immediately after the annexation) runs from end to end. Multan is a town of great antiquity, being identified with the capital of the Malli, whom Alexander conquered in his invasion of the Punjab. The principal buildings include the shrines of the Mohammedan saints, Baha-ud-din, Rukhn-ul-alam, lineal descendants of the Prophet, which stand in the citadel. Close by are the remains of an ancient Hindu temple of the Narsinh Avatar, called Pahladpuri, blown down by the explosion of the powder magazine during the siege of 1849. The great temple of the Sun, from which General Cunningham derives the name of the city, once occupied the very middle of the citadel, but was destroyed during the reign of the zealous Musulman Emperor Aurungzebe, who erected a Jama Masjid or "cathedral mosque" in its place. This mosque afterwards became the powder magazine of the Sikhs. As a trade centre Multan ranks of first importance, being connected by rail with Lahore, and by the Ravi, Jhelum (Jhilam), and Chenab with the whole Central Punjab. It therefore collects into a focus all the trade of the province with Karachi (Kurrachee), and, through Karachi, with Europe. Large quantities of raw produce are annually shipped by country boats and by the steamers of the Indus flotilla at Sher Shah, the port of Multan. The trade comprises every item of produce, manufacture, and consumption in the whole province—the chief imports being cotton and other piece-goods, while the main staples of export are sugar, cotton, indigo, and wool. The population is 50,000.

**MUL'TIPLE, SUBMULTIPLE**. Any number of equal magnitudes added together give a multiple of any one among them. Thus  $4 + 4 + 4$ , or 12, is a multiple of 4. And submultiple is the inverse term to multiple; thus 12 being a multiple of 4, 4 is a *submultiple* of 12. The term submultiple is equivalent to *aliquot part*. For *Least Common Multiple* see **COMMON MEASURE**.

**MUL'TIPLE-POINDING**, in the law of Scotland. Where there are several claimants of the same fund, the holder of the fund, in order to protect himself from the risk of paying it over to the wrong person, may have the rights of

the several claimants ascertained and declared by raising an action of multiple-pounding. This action, which is said to be peculiar to Scotch practice, is so called "because pounding was a term which anciently denoted any distress or diligence in order to debate and settle preferences" (Ersk. iv. 3, 28). Hence, according to the number of competitors for the fund, the action was termed a process of double, triple, or multiple pounding. A multiple-pounding is incompetent unless there is "double-distress"—that is, diligence done, or at least a competition between different claimants (Shand's "Practice," ii. 579). "Interpleader" is the corresponding English term.

**MULTIPLICATION.** If we look at the primary rules of arithmetic, we shall see that multiplication is the only one which cannot be entirely performed upon concrete quantities. To or from 100 yards 50 yards can be added or subtracted, and 100 yards can be divided by 50 yards; but 100 yards cannot be multiplied by 50 yards. The very definition of multiplication requires that every question should contain a number of *times* which another number, abstract or concrete, is to be repeated; and this number of times or repetitions cannot be a number of anything else. Thus to talk of multiplying 10 feet by 7 feet is a contradiction in terms; if it mean that 10 feet is to be multiplied by 7, or that 7 repetitions of 10 feet are to be made, 10 feet is multiplied *seven* times, not *seven-feet* times. But if it be meant that 10 feet is to be repeated as often as 7 feet contains *one* foot, the question has three data, and is in fact a question of multiplication in which the number of repetitions is not given, but is to be extracted from the result of a question in division. The symbol of multiplication is  $\times$ ; thus  $4 \times 3 = 12$ .

The abbreviated process of multiplication rests upon the following principles:—(1) If the parts of a number be multiplied, and the results added together, the whole is multiplied: thus 18, composed of 13 and 5, is taken 7 times by taking 13 and 5 each 7 times, and adding the results. (2) Multiplication by the parts of any number, and addition of the results, is equivalent to multiplication by the whole: thus 13 taken 7 times and 8 times gives two products, the sum of which is 13 taken by 7 + 8, or 15 times. (3) Successive multiplication by two numbers is equivalent to one multiplication by the product of these two numbers: thus 7 taken 3 times, and the result taken 4 times, is 7 taken as many times as there are units in 4 times 3, or 12 times. (4) If one number be multiplied by another, the result is the same if the multiplicand and multiplier be changed: thus 7 times 8 is the same thing as 8 times 7. (5) In the decimal system, the annexing of one cipher multiplies by 10, of two ciphers by 100, &c.

The application of these principles requires that, in the decimal system of notation, the products of all simple digits up to 9 times 9 should be remembered: this is usually done by learning what is called the multiplication table, and this table, which is only absolutely necessary up to 9 times 9, is usually committed to memory up to 12 times 12.

The multiplication of sums of money is facilitated by a process known by the name of *Practice*.

The multiplication of fractions offers no difficulty when the extension of the word multiplication, already described, is understood and admitted. For instance, when we have to multiply  $\frac{2}{3}$  by  $\frac{1}{4}$ , or to take  $\frac{2}{3}$  4-11ths of a time, we see that  $\frac{2}{3}$  being  $\frac{8}{12}$ , 1-11th of this is  $\frac{8}{36}$ , and 4-11ths is  $\frac{32}{36}$ : whence the rule commonly given, namely, multiply the numerators together for a numerator, and the denominators for a denominator. In the multiplication of one decimal fraction by another, as 1.23 by .018, the multiplication of the numerators gives  $123 \times 18$ , or 2214, and that of the denominators  $100 \times 1000$ , or 100,000. But a decimal fraction which has 100,000 for its denominator, has as many places of decimals as there are in both of the others together, whose denominators are 100 and 1000. From

this consideration the common rule (of marking off as many places in the product as there are in both the factors) immediately follows. The operations of multiplication have been much abbreviated by the use of LOGARITHMS. A little care will often enable a considerable abbreviation to be made even in the ordinary practice. Thus if we have to multiply any number by 74284 we may do so at three operations; multiplying first by 7 (that is by 70,000), then multiplying our product by 6 (as  $6 \times 7 = 42$ ), and setting our figures two places to the right, and finally multiplying the line just obtained by 2 (as  $42 \times 2 = 84$ ), and setting the result again two places to the right. Thus

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16592
 74284
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116144
 696864
1393728
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1232520128

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An excellent test of the accuracy of an operation in multiplication is afforded by *casting out nines*. Casting out nines from a number is effected by adding all the integers together and deducting 9 whenever the sum is equal to or above 9, continuing the addition with the remainder only. Thus casting out nines from the number 895427 would be done thus: 8 and 9 are 17, remainder 8, and 5 are 13, remainder 4, and 4 are 8 and 2 are 10, remainder 1, and 7 are 8. Let the sum to be tested be as under:—

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      895427
      64
      3581708
      5372562
      57307328

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Draw a St. Andrew's cross beside the sum as shown; at the left hand put the remainder after casting out nines from the multiplicand, and at the right hand the similar remainder from the multiplier (6 and 4 are 10, remainder 1): multiply these together and put the product at the top of the cross, casting out nines if it is over 9. Then cast out nines from the product of the sum and place the remainder at the foot of the cross. It must be the same as the figure at the head if the sum is accurately worked.

**MULTURES.** In Scotch law, a right of thirlage or of restriction of lands and their inhabitants to a particular mill for the purpose of grinding their grain, constitutes a frequent clause in old charters. The dues payable to the miller in respect of this right were called *multures* (*molturae*). They might be payable either in money or in kind. A similar custom is sometimes found in English manors; and a covenant to do suit to a particular mill is occasionally inserted in an English lease.

**MUM.** a kind of ale or beer very common in Germany, and formerly used in England. It is made of malt and wheat, with sometimes oats and bran-meal added, instead of malt solely. It is not so palatable nor so agreeable as English ale or beer.

**MUMMERS,** masked players of the middle ages. The word is the Old French *monneur*, and comes from an Old Teutonic word *munne*, a mask. No doubt the word is imitative from the sound *mum*, which foolish nurses make even in our own day to startle children, at the same time covering their faces, as if to represent a lion or a bear growling, or what not.

Mummings were sometimes very splendid pageants. Stow has preserved an account of a magnificent entertainment of this sort given by the city of London in 1377 to

Richard II., just before his accession, while Edward III. yet lived. A hundred and thirty citizens took part, personifying the emperor and his knights, the pope and his cardinals, and accompanied with torches and much music. Some of them on arriving at Kennington Palace expressed their desire to play dice with the prince for various costly prizes; and he agreeing to this, they so arranged that the prince always won.

In Fabian's Chronicle we read how in Henry IV.'s reign provision was made for a great "Dysguysynge or a Mummyng" to be shewyd to the Kyng upon Twelfth the Nyght," but how in the morning some of the mummers repented and betrayed to the king how that they "wyth the other Lordys aforenamyd were appointyd to sle (slay) hym in the tyme of the fore sayd Dysguysynge." And that this favourite pastime of "dressing-up" really oftentimes covered seriously injurious designs we learn further from an ordinance of Henry VIII., himself an ardent mummer (see a fine scene in Shakspeare's "Henry VIII." i. 4), wherein is provided that "if any persons do disguise themselves in apparel, and cover their faces with visors, gathering a company together naming themselves Mummers, which use to come to the dwelling-places of men of honour and other substantiall persons, whereupon murders, felonie, rape, and other great hurts and inconveniences have aforetyme growen and hereafter be like to come, by the colour thereof, they should be arrested by the king's liege people as vagabondes and committed to the Gaole without bayle or mainprise for the space of three months and to sive at the king's pleasure."

But the famous mumming before Elizabeth, at Kenilworth, and similar entertainments in the early part of the Stuart-period remind us that the national pastime died a hard death. Puritanism and not proclamations killed it.

**MUMMIUS, LUCIUS ACHAICUS**, a distinguished Roman of the republic. His father (also Lucius Mummianus) had been a man of mark, tribune of the plebs 187 B.C., and prætor 177. Lucius the Younger was prætor in 154, and distinguished himself in Spain. In 146 he was consul, and undertook an expedition to Greece, which he conducted with such thorough success as to earn the surname of *Achaicus*, from the name of the province of *Achaia*, into which he converted the whole country. Mummianus had first to encounter the army of the Achaian League before Corinth, but his was an easy victory over forces weak in themselves and torn by inner dissensions. Corinth was shamefully treated by the Romans, for the appreciation of articles of luxury and elegance had not yet come to the Romans, mere rough soldiers as they were. Polybius, the historian, said soldiers played at draughts upon a famous masterpiece of the painter Aristeidês, and when Mummianus sent some of the priceless Greek pictures to Rome, the citizens there finding them soiled by age, washed them with many scrubbings, and were surprised when they disappeared altogether. Thus were the treasures of Corinth not only plundered, but wasted, and we are left to mourn without one single picture to justify the laudations of Zeuxis and Apelles. The city was burnt to the ground after having been thoroughly plundered and the inhabitants sold as slaves. Much of the artistic spoil was purchased by the wise king of Pergamus, who knew its value, for a mere nominal sum in comparison with its true price.

Barbarian though he was in art matters, Mummianus was one of the best of the great republicans, keen-witted, honourable, and just. He remained two years in Achaia, settled the whole government of the province, appointed the officials, and restored a semblance of order to a country long distracted. Although he was their conqueror, the Greeks respected and trusted him. He entered Rome in triumph on his return. He served the censorship with Scipio Africanus in B.C. 142.

**MUMMY.** See EMBALMING.

**MUMPS**, the popular name for an acute, febrile, infectious disease, attended with a swelling of the salivary glands, generally limited to the parotid gland, but which may include those under the jaw and tongue as well. It is technically known as *Parotitis*, and in Scotland it is frequently termed *The Branks*.

It is most commonly seen in young persons—boys, growing girls, and young men; and though it may occur in adults of either sex, it is said to be very rare after the age of thirty. While it may arise through unfavourable hygienic surroundings, it is distinctly infectious, and it is conveyed as a rule from person to person by contagion. Its incubation-period varies from eight days to three weeks. The first signs of the disease are usually a feeling of restlessness and chill, followed by slight pain in the neighbourhood of one ear, which is greatly increased during any exercise of the jaw, as in eating. The characteristic swelling then appears, and increases until it causes considerable deformity of the face, the patient suffering at the same time from headache, thirst, loss of appetite, and general uneasiness. The temperature, which at the outset generally reaches 100° or 101°, and sometimes rises to 103° or 104°, usually subsides as the swelling increases, and falls to the normal on the third or fourth day of the disease. The swelling, which commences just below the ear behind the angle of the jaw, often increases to such an extent as to involve more or less the whole of one side of the face and neck, and it is uniformly smooth and more or less tender all over the surface. In the majority of cases it begins first on one side, and then as this subsides the other side is usually attacked, but occasionally both sides are affected at the same time. After the continuance of these symptoms for about six or eight days, or in mild cases for a less period, they usually begin to abate, and in three or four days they disappear and the disease is at an end. It not unfrequently happens, however, that the disease during its progress shifts its ground, and the *testes* in the male sex, or the *mammæ* in the female become swollen and painful. In such cases, however, the inflammation of these parts is usually slight and is seldom very painful or long continued. A more serious but very rare complication is for the inflammation to become transferred to the membranes of the brain, thus setting up a very serious and dangerous disease.

The treatment of mumps consists in insuring rest and protection from changes of temperature, the regulation of the bowels by means of gentle evacuants, and the administration of a light, soft, and nourishing diet. Thirst may be allayed by the use of lemonade to which a little bicarbonate of potash has been added, and ice is always grateful to the patient. Local treatment is not often required, but when the swelling is very painful the affected parts may be fomented with warm water, after which they should be carefully dried and covered so as to prevent a chill. In the convalescent stage, tonics, such as quinine, iron, the mineral acids, cod-liver oil, &c., are useful. As a rule the disease, though painful, is not dangerous, and one attack generally ensures a future immunity from infection.

**MUNDIC** is the term used by miners, &c., for the mineral *IRON PYRITES* or bisulphide of iron ( $\text{FeS}_2$ ). It occurs associated with most metalliferous minerals in beds, and it is not uncommonly found in disseminated crystals in some igneous and sedimentary rocks.

**MUN'GO**, a term applied to woollen cloth manufactured from old wool that has been obtained from the rags of hard fabrics. These rags are torn into fibre by the action of cylindrical machines armed with strong teeth. Though soft and warm, and capable of a fine finish, mungo is necessarily wanting in strength and substance, and is chiefly employed in linings, paddings, blankets, and druggets.

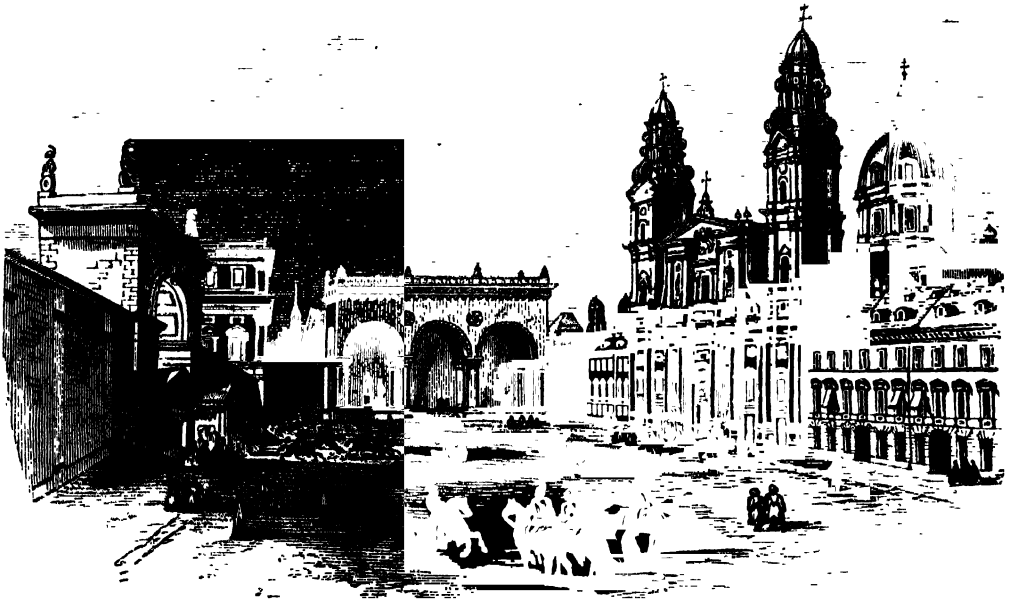
**MUN'GOOS.** See *ICHNEUMON*.

**MUN'ICH** (in German *München*), the capital of the kingdom of Bavaria, is situated on the left or west bank

of the Isar, here crossed by several bridges, 225 miles west of Vienna, on a barren plain, and is one of the most elevated cities in Europe, being more than 1600 feet above the level of the sea. The climate is variable and somewhat cold. The modern town, with its fine suburbs, has grown up around the old town, which forms a semicircle with its base resting on the river. The largest suburb is the Au, lying beyond the two arms of the Isar, and connected with the old city by two bridges. The population in 1881 was 230,023, chiefly Roman Catholics. Before 1820 Munich was a second-rate German capital, not distinguished for its architecture, but merely as the residence of the Elector of Bavaria. It owes its present beauty and celebrity as a seat of the fine arts chiefly to Ludwig I., king of Bavaria, who abdicated in favour of his son in 1848. He devoted his fortune and the best portion of his life to its embellishment; and the improvements in it,

including the erection of numerous public edifices, museums, churches, &c., were planned under his auspices, chiefly by one eminent architect, Von Klenze. Sculpture and painting were equally patronized, and the arts of painting in fresco, in encaustic, and on glass, were revived with only partial success. The houses of the old part of the city of Munich are irregular in size and form; their fronts are crowded with windows, and are ornamented with stucco patterns and scroll-work. The great market-place (Schrannen-Platz) and neighbouring streets still retain the character of ancient Munich. In the new quarters and suburbs beyond the line of the old walls, the number of fine buildings, for the most part imitations of famous edifices which have been erected in recent times, has scarcely a parallel in any other European capital.

The following are the principal public buildings:—The Alte Residenz, or old palace, is a vast pile, said to have



Royal Palace, Munich.

been erected from the design of Vasari, by Maximilian I., at the close of the sixteenth century. Vast as this pile before was, it has been greatly extended by two others, namely, the Neue Residenz (new palace), or Königsbau, and the Festsaalbau, which may be considered as incorporated with it, and forming together with it one enormous mass of building. The Königsbau, begun in 1826, from the designs of Leo von Klenze, adjoins the old palace at its south-west angle, and forms the north side of the Max Joseph's Platz; while the centre is adorned with the splendid colossal monument in bronze of King Maximilian Joseph. The façade of the Königsbau is 406 feet in length. The exterior is severe and monotonous. The interior has obtained its celebrity on account of the taste displayed in its decorations, the extensive employment of fresco painting and sculpture, and the high talent manifested in them by Schnorr, Zimmermann, Kaulbach, Schwauthaler, and other artists. The second and later addition to the Residenz,

also by Klenze, called the Festsaalbau, has a façade towards the Hofgarten (of which it extends along the south side about 800 feet in length). The Hofgarten itself is a planted square of about 1100 feet from east to west and 700 from north to south. Around two sides of it are arcades decorated with frescoes.

The Glyptothek, or sculpture gallery, stands with its south or principal front towards a large open space called the König-platz. It is about 220 feet square in plan, with a court in the centre. The front is in the Greek style, of great beauty. The Pinakothek, in some respects the best of Klenze's works, is a much more extensive edifice than the Glyptothek, and altogether different both in its plan and its style of architecture. On the lower floor, at the west end of the building, are a library and rooms for collections of prints and drawings. The upper floor contains one of the most magnificent collections of pictures in the world. The new Pinakothek is devoted to the works of recent artists.

The Allerheiligen Kapelle, or chapel royal, is in the Byzantine or Lombardic style of architecture. It is about 70 feet wide and 70 high, exclusive of the lower portion on each side, covered with a half-gable, whereby the entire width is increased to about 100 feet. The interior is very magnificent. The principal walls are covered with frescoes on a gold ground. On the south side of this magnificent chapel is the Hof Theatre, the largest in Germany, containing seats for 2400 spectators. On the west side of the Odeon-Platz are the Odeon Palace and Leuchtenberg Palace, whose opposite fronts towards the street that runs between them present two handsome façades in the Italian style. Northwards from the Odeon-Platz runs the Ludwigs-Strasse, one of the handsomest and most regular streets in Munich, having on its east side the Kriegs-Ministerium, the public library, the Ludwigs Kirche; on its western side, the Maximilian Palace, Blind Institute, &c., and terminating in the spacious quadrangle of the Georginum, or university buildings. All these are modern buildings, of great magnitude and beauty, and they render the Ludwigs-Strasse one of the noblest streets in Europe. In the fine Maximilian-Strasse, three-quarters of a mile in length, are situated the Government buildings and the Bavarian National Museum. The latter contains a magnificent and unrivalled collection of objects illustrative of the progress of civilization and art. At the end of the Maximilian-Strasse is the Maximilianeum, founded to give advanced instruction to students who have shown special aptitude for the civil service.

The cathedral, or Frauenkirche, which was begun by Duke Sigmund in 1468, and completed twenty years afterwards, is a brick building, in a poor style of Gothic architecture. It has two towers, 319 feet in height. Next in point of antiquity is St. Salvator's, now the Greek church, erected in 1494; after which, according to the succession of dates, comes St. Michael's, or the Hofkirche, built in 1783. It is 280 feet in length, in the form of a cross, and is a truly beautiful structure. It contains Thorwaldsen's magnificent work, the tomb of Eugène Beauharnais, duke of Leuchtenberg, and stepson of Napoleon Bonaparte. Other churches are the Trinity Church; Ludwigs Kirche; the Church of St. Maria Hilf, in the Au suburb, a fine architectural work in the Pointed style; the Basilica of St. Bonifacius, by Ziebland, in the Byzantine or Lombard style, of great beauty, and richly decorated; the Church of the Theatiner, with the burial vaults of the royal family; and Protestant and Greek places of worship, a Jews' synagogue, &c. The Old and the New Rathhaus are worthy of mention. In front of the latter is a beautiful bronze fountain, where the butchers' apprentices "take up their freedom," and to do so have to take the Metzgersprung or butchers' leap into the basin of the fountain, on the occasion of the annual festival in commemoration of the abatement of the great plague which in 1623 had been raging in the city. The opera-house, university, academy of art, and post office also deserve mention among the public buildings, and a monument erected to Maximilian II. in 1875 is very fine. There are also two triumphal arches, one an imitation of the arch of Constantine, and the other to celebrate the struggle of the Greeks for freedom, and the glories of the reign of King Otho, who by a singular coincidence returned home from his kingdom the day after this monument was inaugurated, 30th October, 1867. In the Karolinen-Platz is an obelisk 100 feet high, which was made out of cannon taken from the Russians in 1812, and was erected to the memory of the 80,000 Bavarians who were engaged in that campaign. Near the Hofgarten is an imitation of an English park, called the Englischer Garten. At the west of the city is a colossal bronze statue of "Bavaria," by Schwanthaler, 84 feet high, and near it stands the "Hall of Fame."

All the superior courts, &c., of the Bavarian dominions

are held in Munich, which has numerous public scientific and literary institutions. Among them are—the Royal Academy of Sciences, founded in 1759; the Leuchtenberg Gallery, formed by Prince Eugène Beauharnais; an academy of arts, with a triennial exhibition, salaried professors, and pensioned students; and the Royal Library, which has upwards of 800,000 volumes and 21,000 MSS. A general conservator has under his care the public library of 400,000 volumes and 8500 MSS.; the museum of natural history; the Brazilian museum, composed of the collections formed by Dr. Spix and Dr. Martins; the physical, mathematical, and polytechnic collections; the botanic garden, the cabinet of medals, the antiquarium or cabinet of antiquities, the chemical laboratory, the magnetical and meteorological observatory at the village of Bogenhausen, 2 miles to the north-east, &c. There are two gymnasia for the higher branches of education, the military academy, the veterinary and medical-clinical schools, the seminary for forming teachers, the central polytechnic, and numerous other schools of art and science. The university comprises five faculties, and has sixty ordinary and twelve extraordinary professors, a medical school, and a library of 160,000 volumes. It was founded in 1472, removed from Landshut to Munich in 1826. The charitable institutions of the city are numerous.

The manufactures of Munich are of many different kinds, chiefly for the consumption of the city and neighbourhood; the articles made are waxcloth, silk, damask, paperhangings, carriages, pianos, &c.; but except bronze and iron works, silk mills and sugar refineries, the city has few factories. There are extensive breweries for the national beverage, Bavarian beer; some distilleries, tanneries, &c. The city is celebrated for the excellent mathematical, surgical, and optical instruments—telescopes especially—made in it. It is also famed for its lithographers, an art invented here about 1800, engravers, and glass painters. Munich is supposed to derive its name from having been founded, in 962, on a site belonging to a fraternity of monks (*münchen*). It was walled by Otho IV. in 1157, and taken by the Swedes under Gustavus Adolphus in 1632.

**MUNICIPAL CORPORATIONS.** The term municipal is derived from the Latin adjective *municipalis*, which signifies appertaining to a *municipium*. The word *municipium* had several early historical significations among the Romans. Our municipal corporations resemble the Italian cities in the later period of the republic. After the Social War, B.C. 90, the Italian towns became members of the Roman state; they were subject to Rome, but retained their own local administration. Both the original Roman colonies in Italy and the *municipia* (not colonies), as they were called, enjoyed this free condition. A municipal constitution was the characteristic of these Italian towns. The notion of an incorporated body, as applied to a town community, was familiar to the Romans, and their several municipalities were accordingly considered and called Republics (*Reipublice*). The Roman colonies in Italy had a popular assembly and a senate, as Rome had; the people chose their own magistrates, and they had legislative power in their own concerns. The history of these Italian municipalities is traced by Savigny, in his "History of the Roman Law in the Middle Ages" (vol. i.) As these communities existed wherever the Romans formed a provincial government, it is all but historically demonstrated that the town communities of our country, and of other parts of Europe where they exist, have either been directly transmitted from the Roman town communities as they existed under the empire, or have been formed on that model. The Romans had colonies in England, in the proper sense of that term; and the word *colonia* always implies a local administration. It cannot be proved that the Saxons brought with them to England a system of town communities; nor was their mode of settlement of

such a character as to lead us to suppose that they could have established them at first. They certainly found them existing in the chief towns of the kingdom, and it is probable that this Roman institution has continued without interruption from the first reduction of England to a Roman province to the present time.

Under the Anglo-Saxon government the revenue of the king, or rather of the state, had been collected in each shire by the shire-reeve, and in each municipal town by an elected functionary, called a borough-reeve or port-reeve. But after the Conquest, instead of the elective Saxon reeve, there was placed over each shire a Norman viscount, and over each municipal town a bailiff, both appointed by the Norman king. In their eager desire to rid themselves of the royal bailiff, boroughs offered the king a higher sum to be collected from and by themselves, and transmitted directly to his exchequer, than he could farm their town for to an individual; and hence the frequent charters which we soon find issuing to one borough after another, granting it to the burgesses in fee-farm, that is, in permanent possession so long as they should punctually pay the stipulated crown-rent.

The interference of a royal provost in their internal concerns being thus withdrawn, the towns returned naturally to their former free municipal organization. They had once more a chief administrator of their own choice, though in few cases was he allowed to resume either of the old designations, borough-reeve and port-reeve. In all cases he now acted as bailiff of the Norman king; accounted at the exchequer for the farm or crown-rent of the borough; in most, he received the Norman appellation of mayor, which, denoting in that language a municipal chief officer, was less odious to the Saxon townsmen than that of bailiff; though in some he received and kept the title of bailiff only.

The charters of the Norman kings were addressed to "the citizens," "the burgesses," or "the men" of such a city or borough; and the sum of the description of a burgess, townsman, or member of the community of the borough, as Madox in his "*Firma Burgi*" observes, was this:—"They were deemed townsmen who had a settled dwelling in the town, who merchandized there, who were of the hans or guild, who were in lot and scot with the townsmen, and who used and enjoyed the liberties and free customs of the town." The titles to borough freedom by birth, apprenticeship, and marriage, all known to be of very remote antiquity, seem to have been only so many modes of ascertaining the general condition of established residence. The freemen's right of exclusive trading had some ground of justice when they who enjoyed it exclusively supported the local burdens. Edward III.'s laws of the staple authorized the residence of non-freemen in the staple towns, but at the same time empowered the community of the borough to compel them to contribute to the public burdens; and under these regulations it is that the residence of non-freemen appears first to have become frequent.

The progress of wealth, population, and the useful arts produced, in many of the greater towns, the subdivision of the general community into *guilds* of particular trades, called in many instances since the Norman era *companies*, which thus became avenues for admission to the general franchise of the municipality. In their greatest prosperity these fraternities, more especially in the metropolis, became important bodies, in which the whole community was enrolled; each had its distinct common-hall, made by-laws for the regulation of its particular trade, and had its common property; while the rights of the individuals composing them, as members of the great general community, remained the same.

The sole legislative assembly in every municipal town or borough was originally the Saxon *folk-mote*, or meeting of the whole community, called in many places the *hundred*,

and where held within doors, the *hus-ting* or the *common-hall*. This assembly was held for mutual advice and general determination on the affairs of the community, whether in the enacting of local regulations, called *burgh-laws*, the levying of local taxes, the selling or leasing of public property, the administration of justice, the appointment of municipal officers, or any other matter affecting the general interests. In this assembly, held commonly once a week, appeared the body of burgesses in person, to whom, together with their officers, whom they elected annually, every general privilege conveyed by the royal charters was granted; and however vested in later times, every power exercised in the ancient boroughs has derived its origin from the acts of this assembly.

The richest and most influential persons being generally chosen by the inhabitants at large to the highest places in the municipal councils, were often tempted to seek the perpetuation of their authority without the necessity of frequent appeals to the popular voice, and even to usurp powers which it had not delegated at all. Such usurpations, however, were often vigorously resisted by the community at large; and the contests were sometimes so violent and obstinate as to lead to bloodshed. But in course of time, the crown itself, so long indifferent to the details of municipal arrangements, found sufficient motives for encouraging these endeavours of internal parties to form close ruling bodies irresponsible to the general community.

We find in the reigns of Edward VI., Mary, and Elizabeth, besides seventeen boroughs restored to parliamentary existence, forty-six now first beginning to send members to Parliament, making altogether an addition to the former representation (as no places were now omitted) of sixty-three places returning 123 members. But the most important feature in this policy of the crown at this period—that which mainly contributed to attain the object of that policy—was its novel assumption of the right of remoulding, by governing charters, the municipal constitution of these new or revived parliamentary boroughs. Most of these charters expressly vested the local government, and sometimes the immediate election of the parliamentary representatives, in small councils, originally nominated by the crown, to be ever after self-elected. This was the first great step on the part of the crown in undermining the political independence of the English municipalities. The Stuarts followed the example of Elizabeth, and attacked the constitutions even of the prescriptive parliamentary municipalities.

As a matter of course, the self-elected irresponsible bodies, favoured by the crown on account of their servility and the facility with which they might be corrupted, soon became oppressive, partial, and unjust, and the abuses rampant in the municipal corporations of the kingdom were for more than two centuries matters of constant complaint. But nothing of importance was effected in the way of reform until after the passing of the Reform Act of 1832. In 1833 a Royal Commission was appointed to inquire into the existing state of the municipal corporations of England and Wales, and the reports of the commissioners showed that throughout the kingdom a general and just dissatisfaction existed with the state of the municipal institutions, great distrust of the self-elected councils, and discontent under the burden of local taxation for purposes which were regarded with suspicion. In 1835, an Act to provide for the regulation of municipal corporations in England and Wales (5 and 6 Will. IV. c. 76) was passed, and soon afterwards the municipal corporations of Ireland and Scotland were reformed upon similar lines. Forty-two amending Acts of this great measure were subsequently passed, and in 1882 the whole were consolidated into one comprehensive statute (the Municipal Corporations Act) which now regulates the law upon this subject.

In the ordinary English municipal borough the corpo-



ration is composed of a mayor, aldermen, and burgesses, acting by a council elected by the general body of qualified corporators. The number of councillors varies from twelve to forty-eight, according to the size of the borough, and in case of a new incorporation the number is fixed by a provision of the charter.

The *councillors*, collectively called "the council" of the borough, are the body from among whom the *mayor* and *aldermen* are chosen, and of whom these functionaries continue after their election to constitute a part. The council collectively is intrusted with the whole of the deliberative and administrative functions of the corporation. They appoint the town-clerk, treasurer, and other officers for carrying into execution the various powers and duties vested in them by the Act. They may appoint as many committees, either of a general or special nature, for any purpose which in their judgment would be better regulated and managed by such committees. The acts of every committee must be submitted to the whole council for approval, lest the borough should be governed by a small knot of persons, whose appointment as a committee would thus become as much a matter of favour, contest, and corruption as that of the old municipal governing bodies. The council execute all the offices previously executed by the corporate bodies whom they superseded. They appoint from their own body a Watch Committee, of which the mayor is, by virtue of his office, the head; and this committee appoints a sufficient number of effective men to act as constables and preserve the peace by day and night.

The councillors hold office for three years, one-third of their number being annually renewed by election. The aldermen are elected by the councillors and hold office for six years, one-half of their number retiring every three years in rotation. The mayor holds office for one year, and he is elected by the council, either from its own body, or from the body of citizens, but it is only on rare occasions that the power of electing an outsider as alderman or mayor is exercised by the council. The mayor is the chief officer of the borough, and within his jurisdiction takes precedence of every one, gentle or simple. In some boroughs he is awarded a salary or allowance in consideration of the demands made upon his hospitality, but in others the cost of maintaining the dignity of the town in this respect falls entirely upon his private resources.

The council have the control of the borough fund; any surplus in which, after payment of all necessary expenses and of all just demands, they are to apply for the public benefit of the inhabitants and improvement of the borough. If the fund be insufficient they are to order a borough rate, in the nature of a county rate, to make up the deficiency, for which special purpose alone they have the powers of justices of peace given to them for assessing, collecting, and levying it.

The whole of the accounts are audited by borough auditors, of whom one must be a councillor appointed by the mayor, and the other two elected by the burgesses from persons qualified to be councillors. The audit, however, is practically ineffective, as the auditors have no power to discharge improper expenditure, which can only be challenged by writ of *certiorari*.

With regard to the *administration of justice* in boroughs, the queen is empowered to appoint as many persons as she may think proper to be *justices of the peace*, who are not required to have any qualification by estate. The council also of any borough may, if they think it necessary that one or more salaried *police magistrates* should be appointed, make a by-law fixing the amount of salary, and thereupon the queen may appoint such person as she may think fit, so that the person be a barrister of five years' standing. The appointment is given to the crown in order that the administration of justice may be above the suspicion of being tainted by party or local interests, a suspicion which might

be incurred, and even deserved, were the appointment made by the council. The justices of the peace may appoint a clerk, and the appointment is one for which there is usually a keen competition.

In boroughs where the council shall signify their desire to that effect by petition, setting forth the grounds of their application, the state of the gaol, and the salary which they are willing to pay, the crown may appoint a *recorder* for any one such borough, or for any two or more boroughs conjointly. The recorder must be a barrister of not less than five years' standing. He is, by virtue of his office, a justice of the peace of the borough, and is to have precedence within the borough next after the mayor. Such boroughs are to have separate courts of quarter-sessions of the peace, which is to be a court of record, having cognizance of all crimes, offences, and other matters cognizable by any court of quarter-sessions for counties, the recorder being enabled to do all things necessary for exercising such jurisdiction, notwithstanding his being the sole judge.

Towns which are not incorporated may obtain a charter of incorporation by petition to the Privy Council, and the 178 boroughs included in the Act of 1835 have now grown to 212.

**MUN'JEET**, the root of the *Rubia cordifolia*, used for dyeing purposes. It has been imported into European countries as a substitute for madder. The supplies brought into the United Kingdom are chiefly derived from Bombay and Bengal, and their value on importation is between 20s. and 30s. per cwt.

**MUN'JISTIN**, an orange colouring matter found in East Indian madder (*Rubia munjista*, natural order Rubiaceae). The formula is  $C_{12}H_{10}O_4$ . It is allied to alizarin and purpurin, containing two atoms less carbon than the former, and one atom less than the latter. It is soluble in hot water and alcohol, and crystallizes in brilliant yellow plates, subliming readily without decomposition. It dissolves in cold sulphuric acid. The orange solution may be heated without decomposing it, and the munjistin precipitated by the addition of water. With mordants it dyes fabrics a bright orange.

**MUN'STER**, one of the four provinces into which Ireland is divided. It comprehends the southern part of the island, and is bounded W., S., and S.E. by the Atlantic Ocean; N. and N.E. it is continuous with the provinces of Connaught and Leinster. The province is divided into the six counties of CLARR, CORK, KERRY, LIMERICK, TIPPERARY, and WATERFORD.

*History*.—The kingdom of Munster existed at an early period of Irish history. Before the Norman Conquest it was divided into North and South Munster. In the eleventh century Brian, surnamed Boru or Boroimhe, acquired so high a reputation for valour and wisdom as to be enabled to usurp the sovereignty of Ireland antecedently held by the King of Meath. Brian fell at Clontarf fighting against the Danes and such of the Irish as supported them. The sovereignty of Ireland (which was indeed little more than nominal) did not remain in his family, the supremacy of Roderic O'Connor, king of Connaught and paramount of the Irish princes, being afterwards recognized by the chieftains of Munster. Henry II. in person landed at Waterford in 1172 and subdued Munster; but his wars having obliged him to weaken his army in Ireland, the natives rose in rebellion. When the English rallied, Munster was again subdued and parcelled out among various Anglo-Norman barons.

Munster, with the exception of the county of Clarr, was divided into counties as at present in the reign of Henry VIII. Clarr was formerly considered as belonging to Connaught rather than Munster. It was made shire-ground with Connaught in the eleventh year of Elizabeth's reign. It remained part of that province till 1601, when it was added to Munster.



**MÜNSTER**, a town of Germany, the capital of Westphalia and of the government of the same name, situated on the river Aa, in a flat country, is a well-built commercial and manufacturing town. The streets are broad and shaded by trees; the houses lofty but irregular. Of the public buildings the most worthy of notice are—the cathedral; the Church of St. Lambert, built in the finest Gothic style, and in whose tower, taken down for rebuilding in 1881, were preserved the iron cages in which John of Leyden and his two principal Anabaptist followers were suspended in 1535; the archiepiscopal palace, now the governor's residence; the senate-house, the synagogue, and the mansions of several of the nobility. The town has a Catholic college, a gymnasium, surgical and veterinary schools, a botanical garden, a school for deaf-mutes, and manufactures of woollen cloths, linen, leather, beer, draining-tiles, and paper-mills. The city is the seat of all the great offices of the province of Westphalia. The trade in linens, woollens, yarn, Rhenish wine, and the famous Westphalian hams and sausages is very considerable. Münster is celebrated on account of the peace concluded in its town-hall on 24th October, 1648, which put an end to the Thirty Years' War. The portraits of the ambassadors are still preserved, as well as the seats on which they sat. The city is 78 miles N.N.E. of Cologne, and had 40,434 inhabitants in 1881. It was an episcopal see as early as the ninth century. In the thirteenth and fourteenth centuries it was a prosperous Hanseatic town, and even carried on commerce beyond seas on its own account. In 1661 it finally succumbed to the episcopal yoke of the warlike Bishop von Galen. In the eighteenth century it was one of the chief intellectual centres of Germany. Of the university established at this period the theological and philosophical faculties still exist under the name of an academy. The bishopric was secularized in 1803 and annexed to Prussia. During the first French Empire it was the capital of the French department of Lippe.

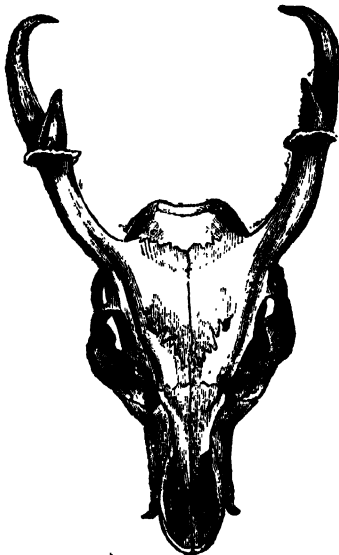
**MUNTJAC** (*Cervulus*) is a genus of DEER (*Cervidae*), inhabiting India, China, and the Malay Peninsula and

which are processes of the frontal bones, and are covered with hairy skin. The horn, after giving off one very short row-antler, curves simply to the tip. The canine teeth of the upper jaw in the male are large, and come out between the lips as tusks. Between the eyes are longitudinal ridges, serving to protect the large suborbital pits. The lateral digits are small and little developed, the bony supports of the hoofs being absent. The Indian Muntjac (*Cervulus muntjac*), or Kidang, is a small but graceful deer, with a long body and rather short limbs. In size it is a little smaller than the roebuck. The general colour is reddish-brown, with the chin, throat, inside of the hind legs, and under surface of the tail white. The antlers are 4 or 5 inches long. The muntjacs are solitary in their habits. Their favourite haunts are hills covered with brush-wood, elevated grounds adjacent to wild forests, or shrubby spots between the forests and the cultivated lands. Their light is swift at first, but unsustained. When brought to bay the males inflict severe wounds on the dogs with their canine teeth. The muntjac has a kind of short shrill bark, whence it is called the barking deer by Indian sportsmen. Reeves' Muntjac (*Cervulus reevesii*) is a very small species from Southern China. Another Chinese species has been described, with very small antlers.

**MURÆNA** is a genus of fishes included in the same family, *MURÆNIDÆ*, as the common eels (*Anguilla*). The body is scaleless. There are no pectoral fins. The orifices of the gills are small and open, one on each side. In each jaw there is a single row of powerful teeth. The dorsal and anal fins are very low, and are united. Over eighty species of the genus *Muræna* are known from tropical and subtropical seas. All are armed with powerful teeth, which in the majority are pointed and well suited for seizing and holding the fish on which they prey; in others, which feed on crustaceans and molluscs, the teeth are blunter and more like molars. The *Muræna* of the Romans (*Muræna helena*) is the best known species. It is found in the Mediterranean and Portuguese seas, and in one instance has been taken on the coasts of Britain. It is also found in the Indian Ocean and on the coast of Australia. It grows to the length of between 4 and 5 feet, and even more. The body is smooth and glossy, beautifully mottled with salmon colour, yellow, and purple. The head is large and swollen, which gives the fish a disagreeable aspect. The flesh is greatly esteemed. This species was kept by the Romans in *vivaria*, and considered one of the greatest delicacies.

**MURÆNIDÆ** is a family of fishes belonging to the order Physostomi, containing the common eels (*Anguilla*), the conger-eels (*Conger*), and the *MURÆNAS*. These fishes have an elongated and often cylindrical body, covered by a thick and soft skin, in which the scales are either absent or deeply imbedded and scarcely apparent. Ventral fins are altogether absent. The vertical fins are confluent, and sometimes rudimentary. The *Murænidæ* form a very large family, with numerous genera and species.

**MURAL CIRCLE** or **TRANSIT CIRCLE** is the name of the piece of apparatus whereby the position of a star is determined on the celestial sphere. It consists of a telescope pointed exactly to the meridian of the observatory, by means of two pillars, between which it is securely pivoted. It can only move in a vertical circle; therefore whenever a star becomes visible in the centre of its field, the star is exactly on the meridian. The telescope is moved, sweeping round a vertical circle upon its centre, until the star sought for is visible, when a graduated arc at the side shows the exact inclination of the telescope, and the declination of the star is precisely fixed—that is, its distance from the celestial equator. The time is also observed by the observatory clock when the star is precisely in the centre of the field of the telescope, and as the time of the first point of Aries is known (this being the point



Skull of the Muntjac.

Archipelago. The muntjacs are remarkable for having their small horns supported on long slender bony pedicles,

from which all stars are measured as to their right ascension) the distance in time, and therefore in space, of the star from that fixed spot is also ascertained; and the two co-ordinates being thus known, the exact position of the star on the star map is fixed.

**MURAT, JOACHIM**, King of Naples, and a celebrated French cavalry leader, was born at Bastide-Fortunière, in the department of Lot in France, in 1768. He was the son of an innkeeper at this village, but always himself asserted that his father was a well-to-do farmer. He received a good education at Cahors and at the University of Toulouse; but preferring the army to the priesthood, for which he had been studying, he enlisted in a cavalry regiment. Here he became a favourite with the men on account of his prowess as an athlete and his daring, but he was, however, dismissed for insubordination. After the outbreak of the Revolution, he obtained a commission in a regiment of chassours, and was rapidly promoted to the rank of major. Recalled from the front in 1795, he made the acquaintance of Napoleon Bonaparte, and when the latter undertook the defence of the Convention he called Murat to his side, and afterwards placed him on his personal staff in the Italian campaign of 1796. In this campaign Murat greatly distinguished himself, and his reputation was further increased by his conduct in Egypt and Syria. As general of division he returned to France with Bonaparte, and assisted him in the revolution of the 18th Brumaire, after the success of which he became commandant of the consular guard, and received the hand of Napoleon's youngest sister in marriage. He afterwards commanded the cavalry at Marengo, Austerlitz, Jena, Eylau, and Friedland, his services being brilliantly conspicuous on every occasion. In return he was loaded with wealth and honours by Napoleon, was created Grand-duke of Berg in 1806, and in 1808 was made King of Naples, where by his handsome presence, gaiety, and extravagant display, he sought to dazzle the Neapolitans. In 1812 he accompanied Napoleon on the expedition to Russia at the head of the cavalry of the grand army, and displayed all his accustomed courage, but his total want of generalship greatly aided to bring about the disasters of the campaign. Returned to Italy he abandoned the falling fortunes of Napoleon, and began to intrigue with his enemies. When in 1814 France was invaded and he was ordered to advance to the support of the emperor he refused. By this defection he for a time saved his own throne, but the delay of the Congress of Vienna to recognize his regal title led him, in 1815, to again look towards alliance with Napoleon, and to announce his intention of restoring the independence and unity of Italy. Defeated by the Austrians at Tolentino, 27th May, 1815, he was compelled to flee from Italy, and took refuge in Corsica; but after Waterloo he made an attempt to recover his throne, and, at the head of a few followers, landed on 6th October, 1815, in Calabria. Here he fell into the hands of his enemies, was imprisoned in the fort of Pizzo, and tried by court-martial on the 13th October, on a charge of disturbing the public peace. By this court-martial he was condemned to death and was shot half-an-hour afterwards, meeting his death with the utmost bravery.

There was in Murat much warm and noble feeling, and though he was but a poor politician as a sovereign he pursued a mild and liberal course. He was personally very courageous, but as vain as he was brave. Although destitute of generalship he fully merited the encomium of Napoleon, as the "best cavalry officer in Europe." A son of his, Prince Murat under the Second Empire, was taken prisoner by the Germans at the ignoble surrender of Metz in 1870.

**MURATORI, LUDOVICO ANTONIO**, a famous Italian historian and antiquary, was born at Vignola (Modena) in 1672, took holy orders as a young man, and became librarian of the great Milanese Ambrosian Library in 1694. Here he edited some valuable Latin and Greek

fragments hitherto unpublished, and a fragment with a list of the books of the New Testament, always called after him the Muratorian Fragment, of date 150 A.D.; and he gained such renown that the Duke of Modena recalled him to his native land as ducal archivist, with great honour. The rest of Muratori's life was spent upon valuable original research in the thorny field of Italian history. In 1751, the year after his death, was completed the publication of his grand work "Rerum Italicarum Scriptores," in which the works of all the chroniclers and historians of any moment are included down to the end of the sixteenth century, with copious original commentaries and dissertations on the social, commercial, military, and political aspects of the various periods, under the title "Antiquitates Italici Mediiævi." It was a splendid achievement, was the work of half a century, and had occupied nearly thirty years in publication, at the rate of about a volume a year on the average. The work is in twenty-eight folio volumes, and the commentaries fill another six. Another fine work of Muratori's was "Annali d'Italia," a history of Italy "from the vulgar era to 1750," which he published in 1762. His famous book on ancient inscriptions ("Novus Thesaurus veterum Inscriptionum") was finished in 1739, and he found time also amidst all these labours to write a complete account of the famous Este family of Modena, for the duke his patron, "Antichità Estense" (1710-40). Muratori, though a priest, was not ecclesiastically ambitious; he was the type of a scholar and lived only among his dusty tomes and manuscripts. The prebend of provost of St. Mary of Pomposa was given him unsolicited, and he was punctual in the performance of his duty. He was more than once challenged as to his orthodoxy, for his strict veracity led him to chronicle and comment upon very awkward historical matters: but his good faith was so transparent that the popes, especially Benedict XIV., shielded him from any harm that might have befallen him. Muratori died at Modena 28th January, 1750.

**MURCHISON, SIR RODERICK**, an eminent geologist and geographer, was born at Tarradale in Ross-shire, 19th February, 1792. He entered the army in 1807, and earned the reputation of an able officer in the Peninsular campaign. After the peace of 1815 Captain Murchison devoted his attention to scientific subjects, particularly geology. After making geological expeditions to various parts of England and Scotland he instituted, in 1830, a special examination of the border-land between Wales and Shropshire and Herefordshire. He there discerned evidence of a special system of rocks, to which he gave the name Siluria, after the Silures, the ancient inhabitants of that part of Britain. His great work, entitled "The Silurian System," published in one vol. 4to (London, 1839), is devoted to the examination of the Silurian deposits in all parts of Europe, throughout which his personal observations were very extensive. In 1840 Mr. Murchison was employed in a geological survey of Russia, in connection with De Verneuil and Keyserling, and on a comparison of some specimens of Australian rock with that of the Ural districts, he was led to suspect the existence of gold in Australia, and called attention to the fact so early as 1841—ten years before the discoveries of the precious metal were made in the colony. The results of the joint investigations of these geologists were published in 1845, the work being entitled "Russia and the Ural Mountains." Sir Roderick was knighted in 1846, and created a baronet in 1866. He acted for some years as secretary to the Geological Society, and was twice elected president. He was also president of the Geographical Society, and supported with special energy the efforts of his great friend and fellow-countryman, Dr. Livingstone. He died in London, 22nd October, 1871, in the eightieth year of his age. The "Life of Sir Roderick Murchison" was very ably and comprehensively written in 1875 by Professor Geikie.

**MURCHISON CATARACTS** occur between the Upper and Lower Shiré rivers, in south-east Africa. They are eight in number, and extend altogether for a distance of 40 miles. The entire descent from the Upper to the Lower Shiré is about 1200 feet, and throughout the whole of this distance the current is exceedingly rapid, being confined to a width of from 50 to 80 yards. The lesser cataracts descend at an angle of not more than 20 degrees, the greater ones at about 45.

**MURCHISON FALLS** are on the Somerset River, or Victoria Nile, Central Africa, about 25 miles from the mouth of the river in the Albert Nyanza. Viewed from below, the cliffs on either side of the river rise abruptly to the height of 300 feet, and are beautifully adorned with thick growing trees. Rushing through a cleft in the rock the river, contracted from a broad and tranquil stream, is pent up in a narrow gorge not more than 50 yards wide, and roaring furiously plunges in a single leap of 120 feet perpendicularly into a dark abyss. The fall of water is snow-white, and has a strangely beautiful effect in contrast with the dark cliffs and graceful palms and other trees around it.

**MURCIA**, an old kingdom of Spain, in the south-east, on the Mediterranean, now divided into the modern provinces of Murcia and Albacete. The sky in this district is throughout the year so blue and bright as to have gained for Murcia the title of "the most serene kingdom." The Murcians are descended from the ancient Phœnician colonists, the Iberians, and the Moors, and are proverbially indolent. The language is Castilian, with a considerable mixture of the Arabic and the Valencian dialect. The area of the present province of Murcia is 4474 square miles, and the population 451,611.

Murcia was the part of Spain first conquered by the Carthaginians, who founded *Nova Carthago*, 202 B.C. The country passed with the rest of the peninsula into the hands successively of the Romans, Goths, and Moors, the last of whom invaded it in the beginning of the eighth century. It formed a part of the caliphate of Cordova till 1144, when it was annexed to the kingdom of Granada. In 1266 it was taken by Alfonso X. of Castile.

**MURCIA**, a town of Spain, the capital of the former kingdom of Murcia, 228 miles south-east from Madrid, is situated in a rich irrigated valley on the left bank of the Segura, and has a population of 91,805. It is the residence of the Bishop of Cartagena, whose diocese comprehends almost the whole of the old kingdom of Murcia. The principal buildings are—the decorated cathedral, the parish churches, several colleges, an hospital, the bishop's palace, the town-hall, the granary, the custom-house, and a house for the public weighing of silk; there are also some libraries, a botanic garden, and a castle. Many of the public buildings were injured by the earthquake of 1829. Murcia was formerly fortified, but is now open on every side. Four of its ancient gates, however, remain. The streets are narrow, crooked, and irregular, but clean. The houses are mean and gaudily painted in pink and yellow; many have gardens attached, filled with orange or palm trees. There are many squares. A handsome bridge of two arches connects the city with the suburb of San Benito, on the right bank of the Segura. The city has several potteries, cloth factories, oil-mills, establishments for the spinning of silk and for the manufacture of soap and white lead. There are also royal factories of gunpowder and nitre, the salt-petre of Murcia being the best in Spain. A good trade is done in red pepper, and there are important glass-works in the environs of the town. Wine and provisions of all kinds are exceedingly cheap. The manufacture of the esparto grass into baskets, cordage, sandals, &c., employs many hands. Murcia was rebuilt by the Moors from the materials of the Roman *Murgi*. It was sacked by the French in 1810.

**MURDER.** By the law of England murder is the destruction of human life, accompanied with an intention to kill, or to great bodily harm, or wilfully to place human life in peril; or resulting from an attempt to commit some other felony; or occurring in the course of resistance offered to ministers or officers of justice, or others rightfully engaged in carrying the law into execution. All other cases of culpable homicide—in which death is produced involuntarily, but is occasioned by want of due caution; or where, though death is produced voluntarily, the crime is extenuated by circumstances; or where a minister or officer of justice is killed, but sufficient authority did not exist, or was not communicated to the party before the fatal blow was given; or where any other circumstances essential to the crime of murder are wanting—amount only to simple felonious homicide, or, as it is commonly called, without regard to the age or sex of the party killed, *manslaughter*.

In the modern law of England the crime of murder is characterized by having been committed with malice aforethought, or, as it is sometimes called, malice *prepenae*. But the term "malice aforethought" is frequently applied to a state in which there is no malice in the ordinary sense of the term, but only malice in a legal sense. If A shoot at B with intent to kill him, but by mere accident kill C, this is a killing from implied malice. And if two or more combine to do an unlawful act against the queen's peace, of which the probable consequence might be bloodshed, and one of them kill a man, it is murder in them all, because of the *malitia preconcepta*, or evil intended beforehand.

Every homicide is presumed to be malicious until the contrary be shown. But circumstances may extenuate the offence, and reduce it from the crime of murder to that of manslaughter; or the act may amount either to justifiable or excusable homicide. In cases of justifiable homicide, and, according to modern practice, in cases of excusable homicide, the party causing the death is discharged from responsibility.

To constitute legal homicide, the death must result from injury to the *person* (as contradistinguished from causes operating upon the *mind*) occasioned by some act done by, or some unlawful omission chargeable upon, the party to whom such homicide is imputed. The terms "wilful omission" apply to every case of noncompliance with a legal obligation which the party may be under, to supply food, clothing, or to furnish any other assistance, or to do any other act for the support of life, or for the prevention of injury to it. It is not homicide unless death takes place within a year and a day after the injury; or, in other words, it is not considered homicide when the party injured survives a whole year, exclusive both of the day of the injury and of the day of the death; nor where the death is to be attributed to unskilful treatment, or other cause not resulting from or aggravated by the injury sustained.

The law of homicide applies to the killing of aliens, except alien enemies killed in war; to felons, except when executed according to law; and to persons outlawed, whether on civil or on criminal process. But a child *en ventre sa mère* ("in its mother's womb") is not a subject of homicide, unless, subsequently to the injury, it be born alive, and die within a year and a day from its birth from the injury received while unborn. See **ABORTION**.

The offence of manslaughter is punishable with penal servitude for life, or for not less than three years, or with imprisonment with or without hard labour, not exceeding two years with fine, or fine without imprisonment.

By the law of Scotland homicide is either *justifiable*, *excusable*, or *culpable*. Culpable homicide may occur (1) from carelessness in doing a lawful act; (2) in doing an unlawful act; (3) where there has been an intention to do harm, though not to kill; (4) where there has been the intention to kill, occasioned by sudden passion and re-

sentment, excited by real and grievous injuries, but without any previous hatred or malice to the deceased; and (5) where there is the intention to kill, accompanied with previous malice and forethought. This last is murder. The general principles of the law of Scotland on this subject for the most part coincide with those of England; and the definition of murder commonly received is, the depriving of a human being of life, deliberately and wilfully, without a cause, and with malice aforethought. But the term "malice aforethought" is not to be received as indicating any rooted and special enmity to the person killed, but in the larger and more general sense of *dole*, or a wicked and mischievous purpose.

In Scotland a person is said to be "art and part" in the crime of murder as in any other crime when he is an accessory before or at the fact, that is, when he aids or abets in its commission. But the law of Scotland does not recognize accession *after* the fact as inferring being art and part in the murder.

**MUREX** is a genus of gastropods, forming the type of the family Muricidæ, and remarkable for having furnished the famous Tyrian dye. The liquor which composed the dye is secreted by a special gland situated on the mantle, and according to the old writers was at first of the colour and consistence of cream. This Tyrian purple was the most costly and brilliant dye of which we read in history. Wool which had been well dyed in it, in the reign of Augustus sold for about £36 per pound weight. None but those invested with the very highest dignities of the state were allowed to use it. On the site of ancient Tyre Dr. Wilde discovered numerous broken shells of the species *Murex*



*Murex inflatus.*

*trunculus*: in circular holes cut in the rock; these holes were the mortars in which, as Pliny tells us, the smaller shells were bruised. The shells of *Murex* are remarkable for delicacy of sculpture and variety of form and colouring. The Venus' Comb (*Murex tenuispina*) is well known to collectors from its numerous regularly arranged spines. An imitation of the Tyrian purple is now produced from guano.

**MUREXIDE.** See POMPURIC ACID.

**MURIATIC ACID.** See CHLORINE.

**MURIDÆ** is the largest and most typical family of the RODENTIA. The Muridæ have the widest distribution of the whole of the Mammalia, being the only placental mammals indigenous to Australia, and being only absent from oceanic islands. The domestic rats and mice, which are very typical of the family, have accompanied man in all his wanderings over the globe. The number of species belonging to this family is estimated at 330. The molar teeth are usually three on each side in each jaw, rooted or rootless and tuberculate. Clavicles are present. The thumb of

the fore feet is rudimentary. The tail is typically scaly. The family includes the Rats and Mice (Murinæ), Hamsters (Cricetina), Gerbilles (Gerbillinæ), Voles (Arvicolinæ), Tree-Mice (Dendromyina), Water-Mice (Hydromyina), and four other subfamilies.

**MURILLO, BARTOLOMÉ ESTEBAN**, the greatest of Spanish painters, was born at Seville at the close of 1617. He passed a miserable childhood in neglect and ignorance. A relative gave him a few drawing lessons as a means of livelihood, and thenceforth he was his own master, painting for a dinner in the market-place, and by sheer force of work achieving wonders. When he was twenty-four he saw some copies of Van Dyck, made by Moya, who had studied under the great Netherlander. Murillo, like a true artist, confessed before these pictures that he knew nothing of the mechanism of his art, and at once set off on foot for Madrid. Here he begged Velasquez to help him, and the royal painter was good natured enough to help him right royally—getting him work, letting him paint in his studio, and often giving him priceless instruction. Thus Murillo worked with Velasquez very diligently and successfully for two years. He then returned to Seville (1645), hardly ever to leave it again till his death. In 1660 he established the Academy at Seville, and was its first president. He died at Seville in 1682 in consequence of a fall from a scaffold while engaged in painting an altarpiece for the Church of the Capuchins at Cadiz. His later works are nearly all deeply religious in tone, and altogether in a different manner from his earlier delightfully natural pictures of peasantry, beggar boys, &c., which have given pleasure to so many generations. The National Gallery has excellent specimens of both styles, but the finest scriptural Murillo out of Spain, "the Prodigal Son," is in possession of the Duke of Sutherland. The next finest is the famous "Miraculous Conception" of the Louvre, bought from the heirs of Marshal Soult (who stole it from Spain) for 615,300 francs.

**MURON.** See MYRON.

**MURRAIN.** An infectious and fatal disease among cattle, principally caused by a hot dry season, which induces an inflammation of the blood and a swelling in the throat, which soon prove mortal.

**MURRAY, JAMES STUART, EARL OF**, known in Scottish history by the name of the "Good Regent," was the eldest of three illegitimate brothers, children of King James V. His mother was Lady Margaret, daughter of John, lord Erskine of Mar. He is supposed to have been born about 1533. When but a few years old his father made him prior of St. Andrews; but in the religious struggles which divided Scotland he joined the reformers, among whom he acquired a very high degree of consideration. On Queen Mary's arrival in Scotland to undertake her regal duties, Murray became her prime minister, confidant, and adviser. In this situation he acted with great tact and judgment. He protected the queen in the exercise of her own religion, and in return obtained from her a proclamation highly favourable to the reformers. Mary rewarded his services by conferring on him the title of Earl of Mar. This title, however, having been claimed by Lord Erskine, was soon after resigned, and he was created Earl of Murray. His rival, the Roman Catholic Earl of Huntly, having died, Murray was left in undisputed possession of the chief authority in the kingdom next to the queen. His tolerance, however, excited the jealousy of the reformers, and caused a breach between him and Knox. The queen's marriage with Darnley seems to have effected a reconciliation between them, while it occasioned the subsequent estrangement between Murray and the queen. To this marriage Murray, Knox, and Queen Elizabeth, and their respective followers, were all opposed. Murray not long afterwards quitted Scotland, and resided abroad till a few days after the coronation of the young prince,

James. He had not in the meantime been ignorant of what was going on: Cecil was in constant communication with him; and soon after the queen's surrender of herself to "the prince's lords" at Carberry Hill, he sent an agent into Scotland to attend to his interests.

On 22nd August, 1567, he was proclaimed regent; and immediately proceeded to establish himself in the government. He now held the situation even against the queen herself, taking the field against her at Langside, where she sustained a complete defeat. He also gave evidence against her at her trial. But while passing through the streets of Louthgow, 23rd January, 1570, he was shot through the body by James Hamilton of Bothwellhaugh, nephew to the Archbishop of St. Andrews, in revenge for personal injury. Murray survived till midnight, when he died. He was in the thirty-eighth year of his age.

**MURRAY, LINDLEY**, a once popular English grammarian, was born in 1745 at Swetara, near Lancaster, in the state of Pennsylvania, North America. In 1753 his father, who was a merchant, removed to New York, and at an early age Lindley Murray was placed in his father's counting-house; but disliking mercantile pursuits he prevailed on his father to have him instructed in classics and the law. About the age of twenty-one he was called to the bar, and obtained a good practice. Afterwards, however, he entered the mercantile profession, and acquired sufficient property to allow him to retire to England. He purchased a house and garden at Holgate, about a mile from the city of York, where he resided during the remainder of his life. His first work, "The Power of Religion on the Mind," was published anonymously in 1787. The first edition of his "English Grammar" was brought out in 1795. A second edition was revised and enlarged by the author, and then reprinted. "Exercises" to correspond with the Grammar, and a "Key to the Exercises," were published in 1797, in which year he also issued an "Abridgment of the Grammar" for the use of beginners. For their copyright he received a liberal price, and the entire sum was devoted to charitable purposes. He died 16th February, 1826.

**MURRAY RIVER**, the chief river of Australia, having its origin in the Forest Hill of the Cook cordillera, on the borders of Victoria and New South Wales, whence it flows very circuitously through about 2400 miles along the north boundary of Victoria, north-west, west, north-west, and south, receiving many tributaries, and, passing through Lake Alexandrina, debouches into Encounter Bay. The mouth is shallow and difficult of entrance, but it is hoped that railway and other projected improvements may shortly obviate the inconvenience caused by this obstacle. The river has a navigable course of nearly 2000 miles. The chief tributaries on the north are—the Murrumbidgee, which takes up the Lachlan; further west the Darling, while smaller affluents, before the influx of the Murrumbidgee, are the Sooma, from Mount Kosciuszko, Wakpol, Kyalete, and Coates; on the south it receives from Victoria the Mitta, Ovens, Broken Creek, Goulburn, Campaspe, Loddon or Marraboora. Losing by evaporation in the dry channels and by the arid soil as it advances, it is frequently resolved into a series of pools.

**MURSHIDABAD** (or *Marsudibad*), a city in the district of the same name, in Bengal, on the left bank of the Bhagirathi. Murshidabad is still the most populous town in the district, though its historical importance has entirely departed. The diminution in the number of inhabitants commenced when it ceased to be the capital of Bengal, in 1772. The population is now only 45,000. The town exhibits but few traces of its former grandeur. The chief object of attraction is the new palace of the Nawab Nazim, on the banks of the river, and nearly in the centre of the city. It is a large and imposing pile of buildings in the Italian style, and its proportions are by

some preferred to those of the Government House at Calcutta. There is but one other structure worth notice now standing in the city proper. This is the mosque erected by Mani Begam, in the vicinity of the Mubarak Manzil, formerly called the Kandil Bagh. The peculiarity of this mosque was its liberality of worship. On one side prayers were conducted according to the Hanafi rite of the Sunni sect, while on the other side were being observed the religious ceremonies of the Shiias, the court sect.

Murshidabad, with its suburb of Azimganj, on the opposite bank of the Bhagirathi, is the chief centre of trade and manufacture in the district. The Jain merchants of Murshidabad still rank as the wealthiest of their class in Bengal. The principal industries are those fostered by the luxury of the native court. Carving in ivory, conducted with much skill and finish, is an old specialty of the city. Other manufactures are the embroidery of fancy articles with gold and silver lace, the weaving of silk goods, the making of musical instruments and hookah-pipes. The Raft Festival is still celebrated at Murshidabad in honour of Khwaja Khizr, a name given by the Mohammedans to the prophet Elias. With this saint is connected the celebrated custom of launching tiny light-ships on the river, which may be seen to great advantage on the Bhagirathi. On certain nights in the rainy season thousands of little rafts, each with its lamp burning, are floated down the stream. Their construction is very simple. A piece of plantain or bamboo bears a sweetmeat or two and the lamp. This fête is rendered more picturesque by the unusual presence of the women, who are allowed out of doors for the occasion.

**MUSA** (BANANA), a name given to a genus of plants having eatable fruit, and flourishing in tropical countries. The *Musa paradisiaca* (banana or plantain) is used to a prodigious extent by the inhabitants of the torrid zone; and, from its nutritious qualities and general use, may be regarded rather as a necessary article of food than as an occasional luxury. *Musa textilis* affords manilla hemp or ABACA. The genus *Musa* is the representative of the tribe Musæ, which belongs to the order SCITAMINEÆ. The Musæ are generally stately and always beautiful herbaceous plants with the aspect of a plantain. Only four genera are known of this order, all consisting of species of striking beauty. The Heliconias are the principal American form. The Strelitzias are Cape plants with rigid glaucous leaves. The Ravanala of Madagascar, a noble palm-like plant, is remarkable for the brilliant blue colour of the lacerated pulpy aril which envelops the seeds; the latter are used for dyeing in Madagascar, but none of the order are of any important use to man, with the exception of *Musa* itself. The Musæ differ from other tribes of the Scitamineæ in the following particulars:—The sepals are free or connate into a spathe-like tube; there are five perfect stamens with linear two-celled anthers, and sometimes there is a rudiment of a sixth stamen; the style is central, free; and the stigma has three to six divisions.

In *Musa* the calyx is tubular, with only a slight appearance of being spathe-like; it is longer than the corolla, which incloses the stamens and pistil. There are three cells in the ovary, each with several ovules. The fruit is fleshy and indurulent. There are twenty species, all natives of the tropical regions of the Old World.

**MUSÆ'US**. See *MUSEÆUS*.

**MUSÆ'US, JOHANN KARL AUGUST**, was born at Jena in 1735, and studied in the university there with the intention of entering the church. He did at last receive an appointment; but his wit, and the fact that he had been seen dancing, set his congregation against him. Eventually he abandoned the church, and became professor at the High School of Weimar. The first literary production of Musæus, which appeared in 1760, was his "Gratulation des Second," a satirical parody on Richardson's

novel. This book passed through several editions. After an interval of eighteen years he published his "Physiognomical Travels," an equally witty travesty of Lavater's theories. The success of this work induced him to avow himself the author, whereupon he became the literary idol of the day. Stimulated by success, he forthwith set about his "Volksmährchen." His next work was that entitled "Freund Hein's Erscheinungen, in Holbein's Manier," a kind of literary "Dance of Death." Excepting a collection of novelettes and tales, entitled "Straussfedern," which another hand completed after his death, "Freund Hein," was his last work, for he died 28th October, 1787. The fame of Musäus rests on his "Volksmährchen" (Folklore). Several of these charming tales were translated by Thomas Carlyle. Their undying freshness is retained less by the tales themselves, which Musäus got from old peasants, gossips, and grandames, and which have been better collected since by Grimm and others, than by the witty sly touches with which he adorns them, reminding one of Sterne and of Voltaire in a happy mood. While a satirical twinkle lights up the eye of the tale-teller, he never, however, becomes cynical.

**MUSCÆ VOLITANTES** (Lat. *musca*, a fly; *volitans*, floating about), a name given in medicine to the semi-translucent threads, spots, circles, and filaments which appear to some individuals floating across the field of vision when the eyes are open, and which may sometimes be seen also when the eyes are shut. Their great characteristic is their incessant motion, for in most cases it is hardly possible by any effort of the will to keep them fixed even for a moment. They are of common occurrence in connection with nigricum or sick-headache and some other disorders of the digestion; but they often occur without any sign of disordered health, and form one of the normal conditions of vision. Short-sighted or myopic persons are specially liable to observe the existence of *muscæ volitantes*, and to find them troublesome on account of their number and persistence whenever the eyes are fatigued or the general health is impaired. As a rule, however, they cause no inconvenience, and they are generally associated with a normal continuance of good, and in many cases even acute sight. True *muscæ volitantes* have no pathological significance whatever, and the perception of them need not cause any trouble or alarm. When, however, specks are observed before the eyes which are stationary and persistent, an ophthalmic surgeon should be consulted, as these may be associated with some impairment of vision or organic disease of the eye.

The best way of seeing these spots is to look directly downwards upon the illuminated field of a microscope. They will then be recognized as beaded filaments, variously twisted and bent, sometimes coiled up into knots. They are of grayish colour, and single filaments are readily seen to be made up of highly refractive globules of varying size. As the filaments bend, and are seen now foreshortened and now at full length, it is evident they float in a fluid. Therefore the old supposition that they are scratches on the cornea falls to the ground, and as they move they cannot be due, as Tyrrell asserted, to congestion of the choroid. The experiments of Mackenzie upon his own eyes (*Edinburgh Medical Journal*, 1865), and those of Jahn ("Eutopics," 1864), prove that these *muscæ* are the beaded filaments of the vitreous humour of the eye itself, which among them form a network of loose meshes in a normal state. If it is knotted and disintegrated the detached masses give much trouble to vision, but in the ordinary way the filamentous network is not known except to those who look for it as described, when it may be seen by almost any one.

**MUSCAT' or MASKAT'**, the capital of the sultanate of Oman, south-east Arabia, a fortified maritime city, on a peninsula in the Arabian Gulf. The harbour is safe,

deep, and commodious, but the streets of the town are narrow. It stands at the head of a cove, which communicates with the sea by a narrow entrance, and is girded by bare rocks of considerable height, so as to overhang the town and harbour. Thus shut out from every breeze except the one blowing directly into the mouth of the inlet, there is seldom a breath of air, and the summer heat is oppressive, while the reflection of the sun from the naked hills is distressing. Commercial activity is the prominent feature of the place. Silk and cotton sahes, canvas, and arms are manufactured; hides, horses, asses, dates, and salt are exported; cloths and various kinds of grain are imported. It forms the key of the Persian Gulf, and is the emporium of East Arabia, and with its export trade of two-thirds of a million sterling, and its warehouses crowded with merchandise from the interior of the peninsula, is a tempting prize for the plundering vagrants of the desert. It is under the influence of the Indian government, by whom a subsidy is annually paid for the suppression of the slave-trade. The population (including the neighbouring town of Matara, the chief industrial and trading centre) is about 50,000—a medley of Arabs, Persians, Indians, Banyans, Syrians, Kurds, Afghans, &c.

**MUSCH'ELKALK** is the medial subdivision of the Trias as developed in Germany. It is a reddish-gray shell limestone, about 600 feet thick. It contains great numbers of fossils, though the species represented are few; crinoid stems are abundant; the remarkable genus *Ceratites* occurs here. *Ceratites nodosus* and *Eucrinurus liliiformis* are two of the most plentiful species. This subdivision of the Trias is absent in Great Britain.

**MUSC'IDÆ.** See FLY.

**MUSCLE** is an animal tissue composed of bundles of soft and usually reddish fibres, endowed with a peculiar power of contracting. The muscles are divided into two classes—the voluntary and the involuntary. The former class, those over which the will exercises a direct control, are subservient to all the actions by which the animal is placed in active relation with the external world, as in all the motions of the limbs, of speech, of the eyes, ears, &c., and they are therefore often called the muscles of animal life; the latter class, comprehending those whose actions are connected with the internal and nutritive functions of the body, over which the will has no immediate or constant control, form the muscular system of organic life, as the heart, the muscular coat of the stomach, &c. Certain muscles which belong partly to each of these divisions have been termed mixed muscles; such, for instance, as the muscles of respiration and the sphincters. Actual observation shows that the voluntary muscles are striated or *striped*, and the involuntary muscles are non-striated or *unstriped*. The latter are made up of elongated fusiform (spindle-shaped) nucleated fibre-cells of flattish form, averaging from 3500 to 4500 to the inch in breadth, and 800 to 600 to the inch in length, clear, granular, and brittle; each separate muscle cell consisting of a fine elastic sheath, which contains a bundle of contractile fibrils and an oblong nucleus. Such is the structure of the unstriped and involuntary muscles of the coats of the whole digestive canal from the lower half of the gullet through to the rectum, also of most of the urinary system, and the coats of the respiratory tract, and of muscular fibres in parts of the body similarly not under control of the will; for instance in the skin, where the stimulus of cold causes them to roughen the integument in the fashion commonly called "goose-skin." Far more important are the muscles wholly or partly under the control of the will. These are all striped, and even the heart is among them, although it is independent of voluntary control. A striped or voluntary muscle is made up of fleshy bundles called *fasciculi*, and each fasciculus is enveloped by a fine tissue (*perimysium*), at once connecting it with and separating it from the

neighbouring fasciculi. Further, each fasciculus within itself is similarly divided into smaller sheathed bundles, made up of separate fibres. A single muscular fibre is composed of an external fine transparent structureless membrane called a sarcolemma, containing a contractile substance, of a diameter about 500 to the inch and fairly cylindrical. The contractile substance is made up of bands, giving the characteristic striped appearance—broad, highly refractive pale yellow bands (the contractile discs), and narrow, less refractive bands (the interstitial discs); if one were to make a pile of sovereigns separated by discs of brown paper, one might have a vague notion of the structure.

All the muscles receive large arteries and veins from the trunks passing near to them, whose branches run in the cellular interspaces between the fasciculi, and form at last an irregular network among the fibres. They receive also a large supply of nerves, probably more than any other organs in the body. Nearly one-half of the brain and spinal cord is for the supply of nerves through which the will may act upon the voluntary muscles, or through which their motions may be excited by other stimuli. The involuntary muscles are chiefly supplied from the ganglionic or sympathetic system of nerves.

*Chemically*, the muscles are composed chiefly of fibrin. Those of animals, which form a large portion of our food, have been carefully analyzed by Berzelius and many others, who have found that the muscular tissue generally contains about 77 per cent. of water, the rest being composed of fleshy fibre or fibrin, a small quantity of fat and gelatin, albumen, and colouring matter, and a number of peculiar extracts, of which the chief are osmazone, on which the odour of meat depends, and zomidine, from which it acquires its peculiar flavour. They also contain the salts of potash in large quantities. The nutritive qualities of meat are in direct proportion to the quantity of fibrin which it contains, and this may generally be judged of by the strength and ruddiness of the fibres; hence the more nutritious quality of the muscles of adult than of young animals, and of those parts of animals which are most exercised; though for cooking it is necessary to avoid the toughness of fibre which usually coincides with great strength and a large quantity of fibrin. [See also MYOSIN.] The colour of the muscles is dependent partly on the blood which they contain, but chiefly on a peculiar colouring matter (*hemoglobin*) very similar to that of the blood, which is fixed in their tissue.

The peculiar vital power of the muscular tissue is its contractility; that is, the power which its fibres possess, when stimulated by the will or other means, of shortening themselves, and thus approximating the points to which their extremities are attached. The sensibility of the muscles, through the nerves, to such stimulation is called technically its *irritability*. When muscles contract they become shorter, harder, and thicker, but their actual size remains the same, for what they lose in length they exactly gain in breadth and thickness. The fasciculi are also wrinkled or thrown into undulated lines, which are most visible when the contraction is least powerful and rather trembling. When at rest a muscle is always in a slight state of tension. The object of this is evident, for were the muscle quite loose, an appreciable amount of time would be wasted while it was tightening; whereas, being already tight, a contraction instantly begins to operate.

The relaxation of a muscle presents phenomena exactly the converse of those of its contraction. The power by which the voluntary muscles are lengthened after having contracted is generally the extension to which, when they cease to act, they are subjected by some other muscles (their antagonists) whose action is the opposite of their own. The hollow involuntary muscles are usually extended after contraction by the accumulation of fluids or other substances forced into their cavities by some external power.

An almost infinite variety of arrangement is found in the muscular fibres adapted to the especial purpose which each muscle has to fulfil, whether it be chiefly strength of action, or rapidity or extent of motion; and all are guided by the nicest mechanical rules. Wherever strength is more necessary than a wide extent of motion, the fibres are increased in number and placed obliquely to the direction of the resistance; wherever extent of motion is more needed than strength, the fibres are long, and run almost straight from one point to the other, so as to give the full benefit of their contraction; where velocity is required, they are placed at a part of a lever close by the centre of motion, the resistance being placed on a part more distant from the centre. In general the absolute power exerted by a muscle in contracting is much more than its efficient power, a great part of its force being lost in its being inserted obliquely on the lever which it has to move, or in the distance of the resistance from the centre of motion, or in the resistance which other muscles and the adjacent tissues, which have to be extended, present, &c. But it is constantly found that where power is lost, a corresponding gain of velocity or extent of motion, or of convenience and compactness of form and readiness of action, is obtained.

The *contractility* of the muscular tissue is its power of shortening itself in a particular direction when stimulated—a power which, in the living body, is exercised by the immediate influence of the nerves distributed among the muscles, such nerves being rightly termed *motor* nerves, and being under the direct operation of the will. The muscular tissue may also be stimulated by the application of a mechanical irritation. This latter is an inherent property and belongs to its constitution, and remains for some time after death. Ligaments and tendons support the same weight, whether dead or alive; but a living muscle that lifts 100 lbs. with ease, cannot after death raise 20 lbs. without danger of rupture. When a muscle is newly cut from a limb, it palpitates and trembles for a considerable time; it cannot be nervous power that thus makes it irritable, for the nerves being separated from their origin are dead and powerless. It is not nervous power, for it belongs absolutely to the muscle, and exists in some cases without nervous vitality altogether; hence there is a distinction betwixt nervous sensibility and muscular irritability. The former dies immediately with the animal; the latter lives for a short time after the animal is dead. Muscles are irritable and contractile by the inherent principle of their fibres, and are sensible by the vitality communicated through their nerves. Though nerves are sensible they are not contractile, and cannot perform the functions of muscular fibres.

*Electricity of Muscles*.—When a section is cut out of a living muscle (and the same thing applies to a living nerve), a current of electricity is found to be passing from the middle of the longitudinal surface to the centre of either of the cut surfaces of the removed section, when these are connected with a delicate galvanometer in the usual way. Directly the muscle dies, a state shown by the superinduction of *rigor mortis*, the current ceases. When a muscle is thrown into contraction by the artificial electrification of its motor nerve, this natural muscular electric current may be diminished or even reversed—a peculiarity which has received the name of negative variation.

*Waste of Muscular Tissue*.—It was formerly supposed that each act of contraction on the part of a muscle was accompanied by a correlative waste or destruction of its own substance, and that the quantity of nitrogen in the excreta more especially, and the highly nitrogenous urinary salt (urea), was a measure of the work done. It is now quite ascertained, however, by more careful and delicate experiments, that the waste of muscle and the increase of urea, though they occur together as a rule, do not vary



correlatively; in fact a very great muscular exertion produces only a slight increase in the excretion of urea. But all force in the body must clearly result either from the destruction of the muscles, that is of the body itself (a destruction repaired by subsequent absorption and assimilation), or from the destruction of food, that is of material supplied to the body. It is now clearly proved that muscular exertion, while it increases all excreta, urea among the rest, increases most chiefly the excretion of carbonic acid and water, that is the products of chemical decomposition in the system, especially the combustion of the starchy and fatty foods within the body. The result of this reasoning is that muscles derive their power not from their own disintegration, but from the combustion of food in the body in general, and that they themselves waste to a very little degree in action.

*The Muscular Sense.*—Muscles have a sensibility of their own beyond their sensitiveness to the stimulus of the nerves, &c. This property, as yet still a little obscure, is due to their being supplied not only with motor nerves conveying to them the commands of the will, but with sensory nerves, by which they can transmit impressions to the brain. It is not of the common sense of touch that we speak, for this is possessed by muscles in a very slight degree; if they are cut or pricked they do not give much if any pain, providing the sensitiveness of the skin is satisfactorily annulled during the experiment. It is rather of that power of expressing the feeling of muscular strain both in amount and direction, which has been aptly called the *muscular sense*, that we speak; that which, among other things, tells us of muscular fatigue, cramp, &c., and

aids us to realize the property of *EXTENSION* in matter, by affording us accurate intelligence of the state of the muscles when in action. By this means we distinguish a stress from the right from one from the left, a heavier from a lighter weight, a longer from a shorter muscular contraction, and hence the feeling of the greater or less distance through which a limb has been moved. Thus we can gauge the size of objects with the movement of the eye or of the hand; thus, too, we can keep up our muscular effort by the slightest relaxation becoming manifest. In fact the muscular sense is a sixth sense, though less palpable than the other five.

The Plates prefixed to this volume illustrate the position of the various muscles in the human body, and their names are given in the annexed list. These muscles are named either according to their shape, as the trapezius and rhomboid; their situation, as the temporal and pectoral; their direction, as the rectus and obliquus; their uses, as the various flexors and extensors; the number of their divisions, as biceps and triceps; or their points of attachment, as the occipito-frontalis and the sterno-cleido-mastoid. In speaking of the points of attachment of a muscle, we use the words *origin* and *attachment*, the former being applied to the more fixed point, or that towards which the motion is impelled; the latter towards the more movable point. Muscles whose action is of an opposite character are named *antagonists*; thus, the *flexors* bend the limbs, while their antagonists, the *extensors*, straighten them. So one set closes the eyes, another opens them; one set throws wide the jaws, another shuts them; and it may be asserted that every muscle of the human body has one or more antagonists.

#### MUSCLES OF THE HUMAN BODY.—The figures refer to the Plates.

FIG. 1.

1. Occipito-frontalis.
2. Atollens aurem.
3. Anterior auris.
4. Orbicularis palpebrarum.
5. Compressor naris.
6. Levator anguli oris.
7. Levator labii superioris alaque nasi.
8. Zygomaticus major.
9. Zygomaticus minor.
10. Masseter.
11. Depressor anguli oris.
12. Serno-cleido-mastoidens.
13. Depressor labii inferioris.
14. Orbicularis oris.
15. Platysma myoides.
16. Extensor digitorum communis.
17. Extensor carpi radialis longior.
18. Extensor carpi radialis brevior.
19. Abductor indicis manus.
20. Deltoides.
21. Biceps brachii.
22. Pronator radii teres.
23. Supinator radii longius.
24. Flexor carpi ulnaris.
25. Flexor carpi radialis.
26. Palmaris longus.
27. Aponeurosis palmaris.
28. Abductor pollicis manus.
29. Palmaris brevis.
30. Flexor sublimis perforatus.
31. Pectoralis major.
32. Obliquus descendens externus.
33. Linea semilunaris.
34. Linea alba.
35. Poupart's or Fallopius' ligament.
- 36, 38. Sartorius.
37. Tensor vaginæ femoris.
38. Gracilis.
39. Iliacus internus.
40. Pectinialis.
41. Triceps adductor femoris.
42. Psoas magnus.
43. Vastus externus.

44. Vastus internus.
45. Rectus.
- 46, 46. Tibialis anticus.
47. Extensor longus digitorum pedis.
- 48, 48. Extensor proprius pollicis pedis.
49. Malleolus internus.

FIG. 2.

1. Corrugator.
2. Temporalis.
3. Masseter.
4. Buccinator.
5. Orbicularis oris.
6. Depressor labii inferioris.
7. Levator anguli oris.
8. Serno-cleido-mastoidens.
9. Extensor ossis metacarpi pollicis manus.
10. Extensor primi internodii.
11. Extensor secundi internodii.
12. Indicator.
13. Abductor indicis manus.
14. Flexor sublimis perforatus.
15. Lumbricalis.
16. Flexor ossis metacarpi pollicis.
17. Abductor minimi digiti manus.
18. Flexor parvus minimi digiti.
19. Serno-hyoideus.
20. Biceps brachii.
21. Pectoralis minor.
22. Serratus magnus.
23. Obliquus ascendens internus.
24. Pyramidalis.
25. Rectus abdominus.
26. Iliacus internus.
27. Psoas magnus.
28. Pectinialis.
29. Triceps adductor femoris.
30. Gracilis.
31. Vastus externus.
32. Cruralis.
33. Vastus internus.
34. Ligamentum patellæ.

- 35, 35. Extensor proprius pollicis pedis.
- 36, 36. Extensor longus digitorum pedis.
- 37, 37. Malleolus internus.

FIG. 3.

1. Temporalis.
2. Occipito-frontalis.
3. Platysma myoides.
4. Serno-cleido-mastoidens.
5. Trachelo-mastoidens.
6. Splenius.
7. Deltoides.
8. Biceps brachii.
9. Brachialis internus.
10. Supinator radii longius.
11. Triceps extensor cubiti.
12. Trapezus seu cucullaris.
13. Latissimus dorsi.
14. Serratus magnus.
15. Obliquus descendens externus.
16. Gluteus maximus.
17. Gluteus medius.
18. Sartorius.
19. Vastus internus.
20. Vastus externus.
21. Ileetus.
22. Tendon of the biceps muscle, forming the outer hamstring.
23. Tendons of the semimembranosus and semitendinosus muscles, forming the inner hamstring.
24. Gastrocnemius externus.
- 25, 25. Peroneus brevis.
26. Extensor longus digitorum pedis.
27. Extensor brevis digitorum pedis.
28. Plantaris.
29. Gastrocnemius.
30. Tendo Achillis.

FIG. 4.

1. Occipito-frontalis.
2. Temporalis.
- 3, 3. Trapezus seu cucullaris.

4. Serno-cleido-mastoidens. Deltoides.
6. Extensor ossis metacarpi pollicis manus.
7. Extensor primi internodii.
8. Extensor secundi internodii.
9. Extensor digitorum communis.
10. Triceps extensor cubiti.
11. Extensor digitorum communis.
12. Latissimus dorsi.
13. Gluteus maximus.
14. Biceps flexor cruris.
15. Semitendinosus.
16. Semimembranosus.
17. Gastrocnemius.
- 18, 18. Peroneus brevis.
- 19, 19. Peroneus brevis.
- 20, 20. Tendo Achillis.

FIG. 5.

1. Temporalis.
2. Complexus.
3. Splenius.
4. Levator scapulae.
5. Rhomboides minor.
6. Supra-scapularis.
7. Serratus superior posticus.
8. Rhomboides major.
9. Infra-scapularis.
10. Triceps extensor cubiti.
11. Extensor primi internodii.
12. Extensor secundi internodii.
13. Indicator.
14. Serratus posticus inferior.
15. Gluteus medius.
16. Obliquus ascendens internus.
17. Biceps flexor cruris.
18. Semitendinosus.
19. Semimembranosus.
20. Plantaris.
- 21, 21. Gastrocnemius internus.
- 22, 22. Gastrocnemius externus, part cut off.
- 23, 23. Tendo Achillis.



**MUS'COVITE.** See *MICA*.

**MU'SES** (Gr. *Mousai*, Lat. *Musæ*), the name of certain sister goddesses in the Greek mythology, who inspired the votaries of the arts and sciences. Hesiod, in his "Theogony" reckons nine Muses, daughters of Zeus and Mnêmosunê, and gives their names as follows:—Kalliope, Klio, Melpomenê, Thalia, Euterpê, Terpsichorê, Eratô, Polymnia, and Ourania, and he says that Pieria in Macedonia was their first dwelling-place. These are the Muses generally alluded to by the poets, and who presided over the following arts and sciences (taken in the same order)—epic poetry, history, tragedy, comedy, lyric poetry, dancing, love songs, sacred poetry, and astronomy. It appears that the worship of the Muses was introduced from Macedonia into Bœotia, Phocis, and other parts of Hellas. The Muses were represented as handsome and modest virgins, dressed in long tunics, with leaves of laurel, ivy, or the palm on their heads. Only three were originally worshipped in Helikon—Meletê, Mnêmê, and Aoidê, or Reflection, Memory, and Song.

**MUSETTE**, a small bagpipe, the diminutive of the *muse*, that is, the *cornemuse*, a French name for the bagpipe proper. Bellows worked under the arm supplied the wind, instead of the mouth of the performer, as in the bagpipe. It had a compass of a little over an octave, covering the treble stave and a little above; and its period of greatest favour was under Louis XIV., when it was at one time the rage at court.

The term is also applied to a small double-reed pipe of the oboe family without keys: and is used now for a stop on the organ which imitates that nasal character of tone. The sort of airs played by musettes, pastoral simple strains, led to the word being taken up by composers as the title of a musical form of dance tune. In the same way the tunes of the little "hornpipe" in England gave the name to a well-known English dance-form. A musette may be either in duple or triple time, but should always have a pastoral pipe-like character, and should be in great part accompanied by a pedal or drone bass. Both Bach and Handel were very fond of the musette form.

**MUSE'UMS.** The term museum is derived from the Greek word *mousetion*, a temple of the muses, and denotes a building or apartment in which are contained rare and interesting objects in nature and art. It was first applied to the building erected in Alexandria by Ptolemy Philadelphus, 280 B.C., for the use of learned men. The word was also applied by the ancients to any repository of natural productions, or such curiosities as had relation to the arts over which the muses presided. Their temples may be regarded as the earliest museums, as in them were preserved various natural objects of interest and value, which were guarded with pious reverence and were accumulated to a considerable extent—e.g. the temple of Juno at Carthage contained the skins of two of the hairy women discovered by Hanno on the Gorgades Islands; the enormous horns of the wild bulls which committed such havoc in Macedonia were hung up, by order of Philip, in the temple of Hercules; and in the temple of Delphi there were suspended the horns of a Scythian animal, in which the Stygian water, that consumed every other vessel, alone could be retained. These were presented by the Emperor Alexander, and the inscription by which they were accompanied has been recorded by *Ælian*.

These curiosities, however, were preserved in the temples merely as memorials or relics; and although Aristotle and Pliny procured many rare productions of nature, in order to note their peculiarities, we hear of nothing like a museum until the time of Augustus, who, according to Suetonius, had one in his palace. One of the chief causes that rendered such collections rare among the ancients was the imperfect knowledge they possessed of the mode of preserving those objects which were subject to decay.

In the middle ages there were sometimes found among antiquities and curiosities of art a few specimens of the dried and stuffed remains of uncommon animals. The awakening taste for art, however, led many of the Roman nobility to adorn their palaces with antique ornaments and statuary, procured by excavation among the ruins of the old Italian cities; and the earliest idea of a museum as known in modern times dates from the time of Cosmo the Great, of Florence, who founded the Florentine Museum.

In recent times museums, instead of being confined to objects of antiquity or curiosity, are set apart for the exhibition of works in every department of modern art, and of collections of rare and valuable natural productions. The latter have gradually been formed into distinct museums of anatomy, geology, zoology, botany, and other great branches of physical knowledge, which modern research has so greatly augmented and developed.

All the capitals of Europe possess museums, more or less complete, the most celebrated of which are—the Vatican at Rome, which is, without exception, the most magnificent museum of antique sculpture in the world; the Florentine Museum; the Museo Borbonico at Naples; the museums of Berlin, Vienna, Munich, Dresden, St. Petersburg; and the Louvre and Hotel Clugny collections at Paris. In America may be mentioned the Philadelphia Museum of Natural History, the Smithsonian Institution collections, and the Museum of Zoology established at Boston by Professor Agassiz.

In Great Britain there are museums in all the principal cities, and now that the value of such institutions is recognized the tendency is towards the rapid increase of their number. The greatest national institution of this kind has already been described under *BRITISH MUSEUM*. Of the other museums the following are the more important:—

1. *London*.—The metropolis, in addition to numerous museums of a special character belonging to the different learned societies, is also the seat of the Soane Museum, a somewhat bizarre collection, and one placed under some arbitrary restrictions as to access, but which contains some valuable paintings, antiquities, coins, rare books, and MSS.; the East India Museum, containing a valuable collection of objects of Indian art, Oriental coins, and specimens illustrating the natural history of the country; the Natural History Museum at South Kensington, the finest museum of the kind in the world; and the South Kensington Museum, an admirably managed institution, containing a collection of British pictures, numbering about 700 oil paintings and over 1300 water-colour drawings, and extensive collections of—(1) objects of ornamental art as applied to manufactures, with an art library; (2) architectural examples, models, casts, &c.; (3) appliances used in education; (4) materials used in building; (5) substances used as food; (6) animal products employed in the arts; (7) models of patented inventions, machines, &c.; (8) reproductions, by means of photography and casting, of antique sculpture and paintings. The Museum of Economic Botany at Kew contains specimens of those vegetable products that are either eminently curious or in anywise serviceable to mankind. It is thus an institution of the utmost consequence in a commercial country, where many of the productive members of the community, such as carpenters, general merchants, druggists, dyers, colourmen, grocers, &c., can find systematically arranged the several objects in which they are interested, accompanied by their correct appellations, the countries which produced them, and the names of the plants from which they are procured.

2. *Oxford*.—The Ashmolean Museum may be regarded as perhaps the oldest museum in Great Britain, as its nucleus was the cabinet collected about 1600 by John Tradescant, who was a great botanist and lover of natural history. His son, inheriting his father's tastes, founded

his Museum Tradescantianum, or Tradescant's Ark, as it was called, the most popular and curious show of the day. He died in 1662, and by his will bequeathed the joint collections of his father and himself to the celebrated Elias Ashmole, who lodged in his house, and who to the Tradescant collection of natural history added medals, coins, paintings, MSS., and books; all these he presented to the University of Oxford, and they were accordingly deposited in the present building, erected by Sir Christopher Wren for the purpose in 1682. Since that period the museum has been enlarged by many very valuable and curious donations of MSS., books, shells, and antiquities. The Oxford Museum, founded by the University in 1855, contains models and instruments for experimental physics, and numerous specimens in the departments of physiology, pathology, zoology, and geology. It contains, besides, lecture rooms, with work-rooms and laboratories where these are required, for the professors in the above-named departments, together with a spacious reading-room and library.

3. *Liverpool*.—The Free Public Museum and Library originated in a movement among the people of Liverpool in 1850, to take advantage of the Libraries Act of Mr. Ewart. On the death of Edward, thirteenth earl of Derby, in 1851, his very extensive collections of objects of natural history were bequeathed to the town of Liverpool, and an Act of Parliament was obtained to provide for the establishment and maintenance of a public library and a museum, the latter of which should contain as an integral portion the collection known as the Derby Museum. After being for some years exhibited in temporary museums, a rich citizen of Liverpool, W. Brown, Esq., M.P., generously offered to be at the whole expense of a new building, which was gratefully accepted by the citizens, and was accordingly finished in 1860 at a cost of about £30,000. The Liverpool Museum now contains one of the best collections in natural history to be met with out of London.

4. *Edinburgh*.—The Museum of Science and Art. The foundation-stone of this museum was laid in 1861. It contains the whole of the museum of natural history formerly in connection with the university. They are of course still freely accessible for the educational purposes of the university. Besides the very extensive zoological, geological, and mineralogical collections of that museum, it contains, in large exhibition galleries, specimens of the raw or workable and other materials of industrial art, the tools and machines employed to manufacture these, and the finished products resulting from their modification; and a library, where the special literature of industrial art may be investigated. The building in which this fine museum is contained cost, with the site, about £50,000, and is upheld by an annual grant from government of £5000. The Museum of the Society of Antiquaries was founded in 1783, and is contained in the buildings of the Royal Institution. It possesses a large number of articles illustrating the antiquities of Scotland; it is the property of government, but is under the custody of the Society of Antiquaries. The Museum of the Royal College of Surgeons contains a large number of specimens and objects calculated to advance the study of surgical science.

Besides these large collections several of the institutions in Edinburgh possess museums. In the university are museums of anatomy, physiology, materia medica, and natural philosophy, botany, and geology; in the Botanic Garden is a large herbarium and museum of botany; in the Royal College of Physicians a museum of materia medica; and in the Royal Society a small mineralogical and geological collection.

5. *Glasgow*.—The Hunterian Museum contains the magnificent collection of curiosities bequeathed to the university by Dr. William Hunter. Its contents have been valued at no less a sum than £180,000, and embrace the choicest treasures of the typographic art, coins in series,

medals, antiquities, natural history, anatomy, together with specimens of the different schools of painting. The medals alone have been valued at £40,000, and the library, with its illuminated MSS., at little less than that sum. The Industrial Museum is located in the Kelvingrove Park.

6. *Dublin*.—The Museum of Irish Industry was founded in 1845 on the plan of the Museum of Practical Geology in London, but is more extended in its objects, as embracing the general range of industrial arts. It has accordingly attached to it a government school of science applied to mining and the arts, and a special chemical department. The great object of the institution of the museum was to afford a general representation of the physical structure and capabilities of Ireland, and the diffusion of sound scientific instruction as to the means by which the resources of the country could be most usefully applied. The Museum of the Royal Dublin Society contains, besides a large natural history collection, a gallery of statuary, in which are casts from the Elgin marbles, &c. The Museum of Trinity College possesses a considerable number of specimens of natural history; also many models illustrating engineering and natural philosophy. The Museum of the Royal Irish Academy includes one of the finest collections of antiquities in Britain.

The Free Libraries' Act, 17 & 18 Vict. c. 64, and 18 & 19 Vict. c. 70, in addition to giving facilities for the establishment of libraries, also contemplates and makes provision for the foundation of museums in towns and parishes. The management of the libraries and museums thus established is vested in the town council; in a district, in the improvement board; in a parish, in commissioners.

**MUSHROOM.** The common mushroom is *Agaricus campestris*. Mushrooms are indigenous; they spring up abundantly in fields where cattle have been pastured, if the soil and temperature prove favourable for the development of the *spawn*, a term applied to the substance from which the mushrooms spring, which presents to the naked eye the appearance of whitish mouldiness. In this state spawn may be kept for years if moisture be withheld; but if the latter be supplied, in conjunction with a proper degree of temperature, it is further developed into white filaments and tubercles, which ultimately rise above the soil in the form of mushrooms. These spring up sometimes singly, but frequently in a gregarious manner (see fig. 1). Mushrooms appear in the fields chiefly after midsummer, in the months of July, August, and most abundantly in September. In fig. 1 may be seen the mushroom in all stages of development, from the "button" to the full grown plant. In the mature mushroom the cap has broken away from the stalk, leaving a ring a short distance down on the stalk. Beneath the cap there is a series of plates (called "gills") radiating from the stalk to the edge of the cap; one of the marks by which the true mushroom is known, is that the gills do not quite reach the stalk. The surface of the gills is covered with projecting cells (fig. 2); at the top of these cells the spores (fig. 3) are attached, which fall and can be seen (if the cap is placed on a sheet of white paper) in the form of brown-black or purple-black dust; this colour is another mark. Other distinctive characters are that the stalk is solid or only slightly pithy; the cap has a narrow margin; its flesh does not deliquesce, and when broken does not change colour; the plant grows in pastures, not in woods or damp places. The large horse mushroom, frequently sold as the common mushroom, is *Agaricus arvensis*. The cultivated mushroom is *Agaricus hortensis*.

Various compositions have been successfully employed in the formation of mushroom beds. Horse-dung, chiefly fresh droppings, or with only some of the shortest litter intermixed, is, however, principally esteemed; and such should be collected when the horses are not on green food, but are being fed on corn, or on corn and hay. If the

beds are intended to be formed of considerable thickness, which some prefer because they continue longer in a bearing state, then it is proper that the fresh dung should be mixed with some old hot-bed materials, or with light loam, in such proportion as will prevent a too violent fermentation. It may then be compactly deposited in any dark situation where the temperature and moderate moisture of the atmosphere can be rendered congenial. Whether it be regarded as a dainty dish for the rich, or as a wholesome and nutritious relish to the poor man's daily bread, the mushroom deserves a far wider cultivation than it has hitherto met with. So far as attempts have been made to stimulate

Fig. 1.



Mushrooms in various stages of development.

the cultivation, more especially in the neighbourhood of London, they have met with great success. In France they are grown very largely, and are even preserved for exportation. The market gardeners of Paris grow mushrooms to a large extent, and better, too, than any gardeners in the world. The quantities they produce in caves, both during summer and winter, are indeed enormous. A report by the British consul at Kanagawa, published in 1877, showed that in Japan mushroom cultivation was carried on to an extent, both for home use and export, which rendered it a most thriving industry of the country. ("Mushroom Culture, its Extension and Improvement," by W. Robinson; "Plain and Easy Account of British Fungi," and "Fungi, their Nature, Influence, and Uses," by M. C. Cooke.)

**MUSIC** is the artistic union of inarticulate sounds and rhythm, exciting agreeable sensations, and raising mental images and emotions directly or indirectly pleasing. The special attribute of music is its power to call up or reproduce states of feeling, not necessarily defined or limited. The power of direct imitation is, in fact, confined within very narrow limits. The song of some birds and the whistling of winds are well-known examples. The charm of music lies in what we may call *indirect* imitation, where some quality common to music and the thing imitated is indicated by sounds, strong or weak, quick or slow, gay or melancholy. Rage is loud, anger is harsh, love and pity are gentle; therefore loud and harsh sounds raise ideas of the former passions and others of the same class; soft and tranquil sounds raise ideas of the latter and others of a similar character.

Hence it will be seen that the function of music is to reproduce states of feeling, though it is not competent by itself to suggest the ideas which also cause that state of feeling, unless by association with words or with some special memory. From this comes the power of song. Words fix the intention of musical sounds, and music enhances by its robe of tone-colour the effect of the words. Nothing more powerful is known in its effect upon the mind. "God Save the Queen" and the "Marseillaise" may almost stand to represent the nations which produced them.

Association, which has so large a share in the operations of the human mind, often contributes much to the effect of

music. Indeed some airs possessing no intrinsic merit owe their influence solely to this principle, and among these the famous "Ranz des Vaches," which, in times gone by, acted with such irresistible force on the expatriated Swiss soldier. It must be admitted, however, that modulated sounds please many to whom they present no imitation of anything material or immaterial, and who associate with them no other idea than that of melody or of harmony. This is the merely sensual pleasure of dance-music and the like, tickling and amusing the ear as pageants and fireworks the eye.

Fig. 2.



Fig. 3.



Owing to its influence directly upon the emotions without the process of reasoning or even perception, music has a remarkable effect upon mental sufferers. Its power, either to produce or to soothe melancholy and even to alleviate the horrors of madness, is shown by countless instances, from Beethoven, who calmed the passionate grief of his friend bereaved of her son, by playing to her for two hours without a single word even of salutation or farewell, to Farinelli by whose singing only was it possible to keep two successive kings of Spain (Philip V. and Ferdinand VI.) anywhere near the confines of rationality. The instance of David and Saul, and the habitual practice in our lunatic asylums of to-day, may further be quoted. The ancients even extended its repute to the cure of sciatica, of deafness, of the plague, &c. (See Plutarch as to this last miracle, given by him to Thelates, a Cretan; but then, as we know by repute, "all Cretans are liars.") Be that as it may, it is an actual fact that the curious sort of St. Vitus's dance called *Tarantism*, which raged in Southern Italy in the fifteenth, sixteenth, and seventeenth centuries, and which popular superstition quite wrongly attributed to the bite of the Tarantula spider (which is almost harmless), could only be cured by music, which first brought the contortions of the sufferers into regularity, and eventually calmed them. Many tunes acquired quite a special reputation for this, and several have been preserved. The power of music to sway the emotions and compel them to a desired mood is of immense use to the church, and religious music therefore plays a large part in most forms of worship. This power, so beneficent in such applications, becomes a source of evil when charlatans seize upon it. All of them have acknowledged its force, from Mesmer to the quack spiritualist pretenders of to-day, who dispose their dupes to receive their impostures by music sounding softly amid thick darkness.

**Musical Instruments.**—The means of producing musical sounds are very numerous. As stated in article **ACOUSTICS**

any noise caused by a periodic vibration, between certain limits of rapidity, will yield a musical note. A column of air set in vibration, as in the human throat, is one of the finest sources of musical sound we have. Instruments of this character are called *wind instruments*, and have several varieties:—(1) The column of air is set in motion by the vibration of *membranous tongues*, as in the human voice, produced by the column of air in the throat and mouth set into movement by the vibration of the vocal chords, and the family of brass instruments where the column of air in a long tube is made to vibrate by the trilling of the lips in the mouthpiece, as the horn, trumpet, trombone, euphonium, ophicleide, bass-tuba, serpent, cornet, bugle, &c. (2) The column of air in a pipe is set in vibration by the beating of a reed against or in an orifice, thus allowing the wind to pass into the pipe, and then checking it with rapid regular alternation. These are *reed instruments*, often called woodwind, as they are nearly all of wood. They are divided into (a) free reeds, when the reed almost closes the orifice, and when chambers are used instead of pipes, as in the harmonium, American-organ, and concertina; (b) beating reeds, when the reed quite closes the orifice, as in the reed-pipes of an organ, the clarinet, the basset-horn, and the bagpipe; and (c) the double reed, when two thin tongues of cane are so held between the lips as to allow them to vibrate, closing the orifice of the tube at whose end they are placed when they swing together, allowing the wind to pass when they swing apart, as in the oboe, bassoon, cor Anglais, and double bassoon (contrabassoon). (3) The column of air in the pipe is set in motion by itself striking against a thin edge and so being thrown into a flutter, as in the common whistle, the diaphon pipes, &c., in organs (that is, all pipes but the reed-pipes), and the flute, piccolo, flûte, and flageolet.

The next great family is that of *stringed instruments*, where the vibration of a string is the source of musical tone. This vibration is caused (1) by bowing, as in the violin, viola, violoncello, and contrabasso, the horsehair of the bow catching the string, pushing or dragging it forwards, and letting it slip back again alternately as it passes to and fro; (2) by plucking with the finger, as in the harp, the guitar, lute, mandoline, lyre, virginals, and harpsichord; (3) by striking, as in the pianoforte, dulcimer, and clavichord.

Further, there are instruments of percussion, (1) where membranes are struck, as in the drums and tambourines; (2) where plates or rods of metal or wood are clashed together, as in the cymbals, castanets, and triangles, or are struck by strikers, as gongs, bells, and the curious instruments of the Siamese, made of plates of wood resting on a frame, a rough copy of which is given in the child's toy made of plates of glass or metal in the same way and called "harmonica" and other names, or in Germany "straw-fiddle." All these instruments have articles specially devoted to them, and their use in composition is described under INSTRUMENTATION.

*Music*, which is both a science and an art, is divided into *Speculative* (or theoretical) and *Practical*. Speculative music explains the nature of musical sounds; shows, by demonstrating their ratios, how they are related to each other; and investigates their physical and moral effects when in a simple or in a combined state: it is, in a few words, the philosophy of the art. [See ACOUSTICS.] Practical music is the application of theoretical principles—the proper conduct of sounds as to their progression, duration, union, and adaptation to words, voices, and instruments, and is the art of composition. See MELODY, COUNTERPOINT, HARMONY, RHYTHM, &c.

*History of Music*.—Our modern music is supposed to be derived lineally from the music of the Greeks. What that music was to the ear, the security and late remains we have fail to show us, but we know very well what its

material was, and this forms the subject of the article GREEK MUSIC. When men tried to renew the art during the dark ages, they made many and grievous mistakes; in their zeal to reproduce the famous Greek music they submitted themselves for centuries to absurd laws, narrowed scales, and what we may almost call tunelessness, because they quite misunderstood the ancient musical treatises which they could no longer properly read, and their efforts were in a wrong direction. The result of their labours was the system of the Ecclesiastical Modes [see MODES, ECCLESIASTICAL], from which it seems only the other day that we shook ourselves free.

Early in the *fourth* century Pope Sylvester (he who received the conversion of Constantine) set up a music school at Rome, but all traces of it seem to have died away by the time of the great Ambrose. St. Ambrose was Archbishop of Milan at the close of the century, and he had practically to recreate the material of music. He reduced the chaos that he found into four modes, or short scales, and every church tune had to be in one or other of them. His collection of music was great, and the services of Milan were unrivalled for their beauty. The antiphonal singing of answering choirs was especially famous. But as no means existed of preserving the melodies, all the elaborate care displayed by Ambrose served for little more than his life-time. A few tunes have been handed down traditionally, but it is quite uncertain if they are genuine.

In the *sixth* century the great Pope Gregory (590–604) determined to refound the work of Ambrose. He discovered as well as he could the construction of Ambrose's four scales, and called them authentic, to these he added four dominants (as we should now call them), and these he called plagal, from the Greek word for athwart, because like all dominant scales they lay athwart the keynote, starting below it and ending above it. St. Gregory is credited with a large body of music called "Gregorian;" but this is really, in the form we know it, much later in date, and though we can say that it may have originally come from Gregory's diligent collection and arrangement we cannot prove it. Rome was now for some centuries the only centre of musical life. Half a century after Gregory's time, Pope Vitalian introduced the use of the organ into churches, but the instruments were very small, and their mechanism so coarse that the great keys were struck with the gloved fist.

In the *ninth* century we find music rising. The Frank king, Karl the Great (French *Charlemagne*), and a little later our own King Alfred, were in constant endeavour to improve the art. A rude system of notation by *neumes* or signs for groups of notes now arose, not much more definite than that as the neumes rose above the text the sound was higher, and as they sank it was lower. A tune could scarcely be read from neumes, or at least not with certainty, but it could be well remembered by their aid. There is a good story of Karl the Great sending for twelve fine singers from Rome, and trying them singly with a piece of music new to them, when to his horror he heard twelve completely distinct melodies. The thick staff he used as a sceptre was brought into play about the shoulders of these "impudent rascals" by the angry prince. And yet they were probably not to blame, for an acquaintance with the monk's habit of writing, or a previous knowledge of the tune, would have enabled them all to sing accurately enough. As the chorister told Handel, to moderate his anger at the mistakes he had been committing, they could "read at sight, but not at first sight."

The *tenth* century brings us the first harmony in the form of Diaphony or Organum, an accompaniment of octaves, fourths, and fifths (i.e. perfect intervals only) to the melody or plain song. That is clearly the description of it given by Ilucbald, a monk of Flanders

(840-932), but it is only credible to us on one of two hypotheses, either that the organum was consecutive, that is, the melody was repeated in the organum as we repeat a fugue subject at a fifth, or an octave, &c., or else, which seems most probable, that the organizing voices were one or two only in number, singing against the whole congregation, who held the melody; in which case, by the rules of acoustics, the extra part would melt into the great tone as upper harmonies. The identical effect is given in the mixture stops of the organ, which used alone are unendurable, but used in the full organ give a brightness of tone not otherwise attainable, they themselves not being heard as separate tones, but melting into the general sound as harmonics or upper partials. [See the articles ACOUSTICS, MIXTURE, ORGAN.] The organ was in familiar use in the tenth century, for we know of Winchester Cathedral as famous for the great size of its organ of 400 pipes.

The eleventh century saw Guido of Arezzo and the beginning of the stave, the use of the sol-fa syllables, and of the curious scales of six notes, called hexachords. And by the close of the century, organum had given way to a freer kind of accompanying extempore melody, called *Discant* (double song), the forerunner of counterpoint. *Discanters* formed a special body of men, much sought after, guiding their "seconds" by many ingenious rules, still extant.

The twelfth century gave us musical notes and the time table, so that the length of these notes could now be measured, the account of which inventions comes to us from Franco of Cologne. Although it had taken till now for the theorists and the church-writers to gain the idea of the necessity of measured music, it must not be supposed that popular songs were as timeless as the Gregorians we know so well and find so difficult to render without accent. Dances and folk-songs know no rules; they follow natural instincts, and many charming melodies, even as old as the ninth century, are preserved to us, their rhythm being indicated by the strong accents of their accompanying verses. Here, as elsewhere, it was the popular instinct which dragged along the church, half unwillingly. The stave was by this time completed by the cultured writers and theorists, so that the pitch and the length of notes could be accurately given.

The thirteenth century gives us counterpoint, whose very name (point against point) shows that the points had driven the neumes at last out of the field. England was now the leading musical country. Walter de Odington was the great authority on the art. The famous canon for four voices, with accompaniment or "pes" for two basses, "Summer is y-cumen in" (Harleian MS., British Museum) bears date 1244. It is the oldest piece of harmonized music in existence. Adam de la Halle and Thibaut, king of Navarre, may serve as types of the troubadours of this century, skilled both in melody and harmony, following out the line of the dances and folk-songs, far ahead of the church composers in effectiveness. The great English canon, and works by the troubadours named, are not unfrequently performed, and can still be listened to with pleasure. The growing pleasure in the intervals of thirds and sixths excited wrath in the dogged theorists. Pope John XXII. in 1322 even issued a bull against the use of the Major Third in church music. But music kept progressing nevertheless, regardless of bulls.

With the fourteenth century the first half of the history proper begins. This is the period of the old tonality and of polyphony, lasting full three centuries. Then came rather more than a century of transition, and since that, for about a century or a little more, we have had the period of the new tonality, which we now enjoy. In the fourteenth century John de Muris, probably an Englishman, improved counterpoint and first used that name. Guillaume de Machault, in the middle of the century, wrote the first

four-part mass with which we are acquainted. It was produced at the coronation of Charles V. of France in 1360. The first great school of music now arose in the Netherlands, and so famous was it for its free counterpoint and its perfection in the canonic or fugal style, that on the return of the popes to Rome in 1377, Netherlands singers were imported to revive the papal chapel. Willem Dufay was singing there in 1380, and his compositions for the church yet exist for us.

The fifteenth century shows us the Netherlands as the musicians of Europe. The successor of Dufay, Ockenheim or Ockeghem, a great master of canon (indeed he sacrifices the beauty of his music altogether for imitative and canonical effects) flourished through the whole of the last half of this century. Ockenheim is often said to have invented canon, but that is as wrong as the attribution of the invention of counterpoint to the great English theorist of the period, John of Dunstable. The fact of the tradition existing shows the great skill of these men, however. Shortly after Ockenheim, who was choir-master to Louis XI. of France, comes Obrecht, another very interesting composer, and quite singable even now. Ockenheim's pupil was the famous Josquin Des Pres (1440-1521), of whom his friend Luther said, "Others do what they can with notes, but Josquin what he will." Josquin's popularity in his own day was prodigious. Some of his works are extremely pretty; for instance, his "Ma petite Camusette" was much admired when used in 1885 in London in lectures to illustrate this period.

The sixteenth century begins with the pupils of Josquin, who were very numerous. Many count among them Arcadelt, Jean Monton, Willaert, who founded the school of Venice and was the inventor of the madrigal, Goudimel, who was the harmonist of the Huguenots, and suffered in the St. Bartholomew for his faith, Clemens-non-Papa (so called to distinguish him facetiously from the reigning pope, Clement VII.), &c. Orlando di Lasso, the favourite of princes (1520-94), always petted and always successful, was also a Netherlander, de Latre by name. The sixteenth century counts Italians also among its children, chief of them the mighty master Palestrina (1511-94), as unfortunate all his life as Orlando was fortunate. With these masters the older art reached its culminating point. Nothing grander in the style can be written than what they have produced. Palestrina is believed to have been a pupil of Goudimel's, and thus the great Italian school first learnt from, and then eclipsed the school of the Netherlands. Other renowned Italians of this period, famous for motet, polyphonic mass, and madrigal, are Nanini, a pupil of Palestrina, and a younger Nanini also; De Rore, a pupil of Willaert; Morales (a Spaniard); Festa and Luca Marenzio (first of Italian madrigalists); Zarlino, famous also as a theorist; Gabrieli, especially great with combined choirs, &c.

Meanwhile in England a very grand school of writers arose, fully the equals, perhaps the superiors of both Netherlanders and Romans. These were Taverner, the organist of Christchurch, Oxford, about 1530; his contemporary, Tye (Doctor of Music at Cambridge, and music-master of Queen Elizabeth); Merbecke (1523-85), who first set the Liturgy for the reformed faith; Tallis (1529-85), who improved Merbecke's setting into the form in which we daily use it; and Tallis's pupil, Byrd (1543-1643), author of "Non Nobis Domine," and of many pieces in Queen Elizabeth's "Virginal Book"; Farrant (died 1581); White; John Bull, first Gresham professor of music; and the great madrigal writers, Morley, Kirbye, Dowland, Weelkes, Wilbye, Benet, and Orlando Gibbons (1583-1625), an exquisite writer. The wonderful work of these men exists yet. Tallis, to show his command of counterpoint, wrote a song in *forty parts*, that is forty distinct melodies, to be sung at once. It was performed by Leslie's choir in 1875, and at the Inventions and Music International

Exhibition of 1885 the original MS. was exhibited. The ballets, madrigals, fa-las, and anthems of these Elizabethan writers are delightful to us even now; and probably England never stood so high as a music-producing nation as in that glorious epoch.

The invention, or rather the perfection of pedals on the organ, is attributed to Bernardo il Tedesco (the German), at Venice, just before the century began (1490), and the perfection of movable musical types to Petrucci at Venice just afterwards, about 1501. [See *Music-printing* in the article PRINTING.] The close of the century was marked by so many things as to rank as the beginning of a new era. The first opera ("Dafne") was produced in 1594 by Peri, but was far excelled by the famous "Euridice," the work of Peri and Caccini, produced at Florence in 1600 on the occasion of the marriage of Henri Quatre with Maria de' Medici. And the first definite oratorio (a style invented about 1560 by the brothers Annimuccia) appeared in the same year, viz. "L'Anima e Corpo," by Cavaliere. This was also a great period for the improvement of musical instruments. Virginals date from about 1520, and are the predecessors of the harpsichord, which came a century later; the bassoon was known in 1530, and the bass serpent in 1560; regals (chamber organs) date from 1540, and the violin was first known in England in 1557. The Protestant reformation, in the hands of Luther, created congregational singing in the form of the German chorale, while the Catholic reformation, in the hands of the Council of Trent, seriously thought of expelling music from the church altogether. One of the main charges against the mass writers was that they took any popular song of the day, set it in the tenor part (actually using the original words more often than not), and then wove the words of the mass round it in counterpoint. Examples of the practice are found in the very first pieces of music, even those by Dufay, and it became at last the universal practice; the masses being known by the names of the tunes, as "My Lady Love," "The Armed Man," &c., upon which they were built up. To any one who has not searched old music the fact seems incredible, but it is not only true, but universal. Palestrina, by producing some fine and dignified original music, completely satisfied the angry dignitaries, and the scandal was put an end to.

The seventeenth century sees the beginning of vast changes. Monteverde (1568-1613) receives opera from Peri and Caccini, transforms it, and by his numerous innovations strikes death-blows at the old tonality. He is the first composer to introduce unprepared discords, writing dominant sevenths as freely as if they were common chords. Previously all discords had to be prepared, and treated not as substantial harmonies, but as passing notes. The difference is incalculable. It is, indeed, the beginning of modern harmony. The growing use of vertical bars to keep the parts under each other (though not as yet to mark the accents), greatly facilitated the performance of rapid and florid works. Carissimi (1580-1673) did with oratorio as Monteverde had done with opera. Monteverde's operas are not now heard with pleasure, but much of Carissimi's work is still charming, and his "Jonah" is occasionally given. Viadana, Allegri (whose "Miserere" is still used in St. Peter's), Frescobaldi, &c., are other good composers of this time, but all are eclipsed by the great Alessandro Scarlatti (1659-1725), founder of the school of Naples, and the greatest musician of Italy next to Palestrina. In Germany Schütz (1585-1672) wrote remarkably fine oratorios, and is undoubtedly in some sense the precursor of Bach. He wrote also the first German opera ("Daphne"), performed at Dresden in 1627. French opera begins with Lully (1633-87), the friend of Molière, under Louis XIV.

In the early part of this century the great English school still continued, most of those already named living into it. Their successors were few; Lawes, the friend of Milton

(1600-62), who set "Comus," among other things; Child, and Locke (1620-77), known by his music to "Macbeth," and author of "Psyche," the first English opera, are alone worthy of notice. Humfrey, Brewer, Blow, and Wise, all of them sound writers of church music, rose in the latter part of the century after the cruel treatment of the Puritans had been recovered from, and music could be regarded otherwise than as a "sinful lust of the flesh." Their anthems, especially those of Blow and Wise, are still frequently heard. Humfrey, at least, studied at Paris a short time under Lully. But Blow is famous more as being the master of Purcell (1658-95) than for his own work, which, though very good, is yet overlarded with pedantic ornament. As for Harry Purcell, he is by far the greatest musician England has had the honour to produce. His early death is a sad loss to us. Contemporary with Purcell were his fellow-students, Jeremiah Clark and Aldrich, dean of Christchurch, Oxford—forming a satisfactory group at the close of the century.

The eighteenth century closes the period of transition and develops the new era. Bach and Handel represent its first aspect, Haydn and Mozart its second. England began the century with a continuation of the anthem-writers in the same school. Dr. Croft (1677-1727); Maurice Greene (1696-1755); the very popular but somewhat feeble Kent (1700-76); Weldon, a fine author (1708-36); Boyce, even better as a judicious collector and publisher than as an author, though his "When shall wisdom be found," is certainly among our best anthems; Barrett, Eccles, Dr. Arne (1710-78), Travers, Nares, Battishill, and Arnold. All these are fine sterling writers—the school, though limited, being quite unique, specially English, and very carefully worked up to rare excellence. The invention of the swell to the organ by Jordan in 1712, greatly aided their musical efforts. A little after the middle of the century, a secular composition, closely analogous to the anthem in form, grew up, and England, who has good claims to be considered the creator of the madrigal, and who has all the honour of the anthem, developed the new form (also strictly confined to English writers) of the *glee*. In 1763 the Catch Club was formed for the promotion of the style of glees and catches. Berg (1728-80) was the first prize winner; Arne and Greene, with Bates, Rock, and others, also worked in the new form. Then arose the great Samuel Webbe, prince of glee-writers (1740-1816), whose life just covers the fine period of the style. Next to him in rank came Spofforth (1770-1827), Stevens (1753-1837), Stafford Smith (1746-1836), Dr. Callcott (1766-1821), Atterbury, Danby, Lord Mornington, Cooke, King, Wainwright, Paxton, &c. There is a greater fund of pleasure in the works of these men and of the Elizabethan madrigal writers than most amateurs of the present day are aware of. Happily a return to the due appreciation of our native treasures is setting in, and once more their choice writings are to be heard, which indeed ought never to have been allowed to slip from remembrance.

It is not pretended that these are writers of the greatest musical rank. Their form was a narrow one, but it is very delightful and full of opportunities for delicate expressiveness, and they are consummate masters of it. The grand current of musical progress of the eighteenth century swept through Italy and Germany. The crowning glory of the contrapuntal era, the fugue, reached its highest point in the hands of the immortal John Sebastian Bach, not so much a composer as the quintessence or fine flower of a whole race of musicians, for the Bachs were a numerous folk. Bach lived from 1685 to 1750; and born within not many miles of him, and actually in the same year (but outliving him by nine years), and yet never once meeting him, was his equally great contemporary, George Frederick Handel (1685-1759). We say equally great—should we say greater? The people would have it so, the musicians

shake their heads. It was Bach, and not Handel, whose works were ever in Mozart's hands, when he met with them at last; and it was Bach and not Handel, a well-thumbed volume of whose works was always to be found on Mendelssohn's pianoforte. But while Bach remained almost stationary at Leipzig, Handel was a great traveller. He worked in Italy with Scarlatti and Corelli, in Hamburg with Reinhard Keiser, the opera conductor, himself author of 100 operas. Here Handel produced his first opera. A visit to England in 1710 was so happy that it was followed by others, and at last by a permanent residence, notwithstanding the fact that at this very time Handel was the salaried servant of the Elector of Hanover. When that same elector became King of England in 1714, Handel's difficult position may be readily imagined. He managed to reconcile himself with the angry monarch whom he had so ill treated, and remained in England, to our lasting benefit, until his death. At first he was known as an Italian opera composer, but his genius growing graver and grander with years, he definitely turned in 1738 to oratorios, with which he had previously won successes ("Esther" had appeared in 1720); "Saul" was the first of the long-continuous series to appear. "Israel" and the "Messiah" and the rest of those immortal works followed. Here it must be noted that there can be no better instance than in Handel of the folly of attempting to distinguish between sacred and secular music simply as music. Handel would take songs from his operas and set them to his oratorios without scruple, if the sentiment of the music were appropriate; and it is only through painstaking antiquaries that we are conscious of the fact. Or *vice versa*, if one of his slower opera airs be played, nearly every auditor will refer it to some oratorio of those unknown to him; as for instance a *largo*, extremely popular as a piece for orchestra, in spite of the "sublime strains" which every one had found in it, proved to be an air from the opera of "Xerxes," when it was sung at the Handel Festival of 1885. Music exemplifies states of feeling, and is incompetent to distinguish between the adoration of a beloved mistress and the adoration of a sublime truth; the attitude of adoration, not its cause, is what it is able to depict. The attempt to cramp religious music into antiquated forms, simply because they are antiquated, is therefore an absurd piece of pedantry, of which Handel, our greatest master of the sublime, must be allowed to cure us.

Contemporary with Bach and Handel, though dwarfed by their genius, were Hasse, the opera composer, Graun, deservedly famous for his great oratorio, the "Tod Jesu," Naumann, &c. In Italy Domenico Scarlatti followed his great father, and Durante, Leonardo Leo, Stradella, Jomelli, and Piccini formed a school led by the first-named of the group. Other great Italians were Pergolesi, author of a lovely *Stabat Mater*, Sacchini, Guglielmi, Lotti, and Marcello of Venice (1686-1739), known best as author of some magnificent settings of the Psalms. In France Lully had been followed by Rameau (1683-1764), a great musician and a still greater theorist; and the name of Rousseau also must be mentioned as powerful in the musical affairs of this time. But in 1773 there arrived at Paris the grand operatic genius of the century, the Bohemian composer, Gluck (1714-87). His fame had preceded him, and those who held to the old ways cried up the Italian Piccini as a rival. The feuds of Gluckists and Piccinists divided Paris; though probably now it would be as hard to find any one who ever heard a note of Piccini's writing, as to find any one at all conversant with music who did not know something fine of Gluck. Gluck's "Orfeo" was heard on the London opera stage not long since and was much enjoyed. Berton, Catel, Isonard, and Grétry (1714-1813) carried on French opera into the next century.

Gluck belongs to the transition period; but the great masters of the close of the eighteenth century open the

distinctly modern school. The tyranny of counterpoint gives way to the rule of harmony; the paramount claims of vocal writing yield to the yearly increasing predominance of instrumental music; polyphony is replaced by melody; discords are more important than concords; equal temperament is necessitated by the pressing need for unlimited modulation, and is, in fact, made compulsory by Bach deliberately writing in all twelve keys, major and minor; music moves in great masses rather than in separate parts; and musical colour and definite key and rhythm relationships come prominently forward. These are the main differences which, after about a century of gradual and tentative progress, were now found in Haydn (1732-1809) and Mozart (1756-91) to have definitely separated the new from the old. Mozart when young learnt from "Papa Haydn;" but Haydn when old was but too glad to learn from Mozart, a greater than he. Between them they created the style of handling the orchestra (now completed by the perfection of the clarinet and the addition of pedals to the harp, and enriched by the violins of the great Cremona makers of about 1700), they formed the opera, the oratorio, the symphony, the quartet, the mass, such as we have them now. Contemporary with these two giants (and probably Mozart is the greatest musician who ever lived), were the children of the great Bach, of whom Carl Philip Emmanuel and John Christian (called the English Bach, from his residence here) are the best known; Albrechtsberger, the great author on counterpoint; and the Abbé Stadler and Vogler, the latter the master of Weber and Meyerbeer, &c.

The early part of the nineteenth century is dominated by Beethoven (1770-1827), as the close of the eighteenth is by Mozart and Haydn. If Mozart is the greatest of musicians, Beethoven is by far the greatest soul who ever used music as the robe of his thoughts. He crushed music to his will with iron hand; forced it to say things it had never before said; and has driven us all from now and henceforth to strive for that earnestness and deep inner meaning which he alone has fully brought forth in tones. Beethoven also stands as the first of the great pianoforte writers. In him, at last, there is no trace of the harpsichord, such as we perpetually find in both Mozart and Haydn. The pianoforte was invented in 1709 by Cristofori at Padua; but Bach, who played on it at Berlin, preferred the harpsichord (or, of course, far more his beloved organ), and Mozart never took kindly to it. Beethoven enlarged the scope of the symphony, of the quartet, of the concert-overture, of the opera. Contemporary with him were the pianoforte composers Pleyel (1757-1831), Steibelt, Woelfl, and Dussek (1761-1812), the far greater Clementi (1752-1832), who is buried in Westminster Abbey, and Hummel, Mozart's pupil, most finished and graceful of them all. Salieri, Cimarosa, Paer, wrote operas, now forgotten. The greatest church composer of the period, though by birth Italian, must be reckoned a Frenchman, on the same ground that we claim Handel as an Englishman. This was Cherubini (1760-1842), who lived in Paris all his long life after he was twenty-six, and whose masses, and particularly his requiems, are extraordinarily fine. He also wrote grandly for the opera ("Medea," "Deux Journées," &c.) His operatic contemporaries were Méhul, Boieldieu, Gosssec, and the Italian Spontini (1784-1851). Greater still than Cherubini was Ludwig Spohr, the German composer (1784-1859), originally a violinist, a wonderful master of the orchestra, and author of some of our most favourite symphonies and smaller oratorios, over-addicted to the use of chromatic harmonies, but always delicately graceful and charming. And far greater than he is Karl Maria Von Weber (1786-1826), whose pianoforte works, whose glorious operas, "Freischütz," "Oberon," and "Euryanthe," are among the most cherished of our possessions. Perhaps even greater than Weber is Schubert, long only known as the most wonderful of song-writers in the whole extended



history of music; but now recognized as second only to Beethoven in poetical insight, as shown in symphony, trio, and quartet. Schubert's pianoforte works and his masses are very fine; and his "Unfinished Symphony in B minor" is perhaps the noblest piece for the orchestra which we possess, full of an almost supernatural glamour.

The succeeding portions of the nineteenth century finds the noblest paths of the art still in German hands. The sceptre of opera passed, however, to Italy for a time. Rossini (1792-1868), Donizetti (1797-1848), and Bellini (1802-1835) almost drove everything else from the stage, and Verdi, in the earlier part of his career, followed in their footsteps. Rossini ceased to write opera after producing "Guillaume Tell" at Paris in 1829, and practically became a Frenchman. Succeeding the Italian era is the reign of Meyerbeer (1794-1864), who, though a German and a fellow pupil of Weber, deserted the German style completely for the French, and all whose triumphs are associated with the Paris stage. He wrote only six French operas, but all of them are among the masterpieces of the stage. With Meyerbeer we reach the time which has but just passed away, the middle of this great century, and a brief review of the leading names of what is fresh in every reader's mind will be sufficient.

In Germany Mendelssohn (1809-47), Schumann (1810-56), and Moscheles (1794-1870) took the highest ground. Zelter was Mendelssohn's master and friend. Lindpaintner, Czerny, Kalkbrenner, Hauptmann, Marx, and Reissiger honour the German record.

In France Chopin (Polish on his mother's side) gave a fresh new life to pianoforte writing (1810-49); Berlioz (1803-69) proved himself the greatest virtuoso with the orchestra who has yet existed; Auber, Halévy, Bizet, and David held the operatic stage.

In England Wesley's church music of this period is as fine as any we have (1766-1837); and he was followed by his gifted son, Samuel Sebastian Wesley (1810-76), by Dr. Crotch, and Attwood (1767-1838), pupil of Mozart and friend of Mendelssohn. Field and Cramer (a German long resident here) created an English school of pianoforte playing. Bishop and Horsley, with Attwood and Wesley, wrote magnificent glees, fully equal to those of their predecessors. Wallace (1814-65) and Balfe (1808-70) tried hard to found English opera; and Sir Julius Benedict, a German by birth (1804-85), and Sir George Macfarren in his earlier career, worked in the same paths.

We have now arrived at the present time. Wagner closed his stormy career in honoured and triumphant old age, in 1883, recognized as the greatest of living operatic composers. Sir Michael Costa, whose oratorios still are in favour, but who won his fame among us as conductor of the opera, of the Sacred Harmonic Society, and of the Handel Festivals, during a long life, passed away in 1884. Benedict died in 1885. Sir William Sterndale Bennett closed an honoured career in 1875, leaving us little in bulk, but all of the highest excellence. Sir John Goss, organist of St. Paul's, a composer equally successful at the glee and the anthem, died in 1880. Yearly the famous names thus lessen; but among those who must also be named as now living, or as lately dead, are Johannes Brahms and Joachim Raff, the Abbé Liszt and Niels Gade (the Dane), as great masters of the orchestra for Germany, Rubinstein (as far as his birth is concerned) for Russia, and Joachim and Dvorák for Hungary. Gounod, as the greatest master of oratorio and opera, with whom are Thomas and Massenet, in France, Verdi and Boito in Italy, hold the stage, and in England a special kind of comic opera is apparently the sole possession of Sir Arthur Sullivan. Barnby, Leslie, Mackenzie, Hatton, Villiers Stanford, Gadsby, Stainer, and Macfarren (whose loss all lamented in 1887) do honour to what we may fairly style our own time.

At no time was music so heartily cultivated as it is now,

at no time was there so generally high a level of musical ability and skill in performance, and what is best of all, at no time was music so cheap and so popular, so truly the one great consolation and amusement of the people at large, the ray of heaven breaking in upon their sordid lives and raising them for a few moments to a higher plane of emotion. We have no Bach nor Handel, no Mozart nor Haydn, no Beethoven nor Schubert, no Mendelssohn nor Schumann now living, but we have what is far better, this general and widespread culture of the noblest and purest of the arts.

NATIONAL MUSIC is the name given to those songs or melodies whose actual composers are most generally unknown, but which are handed down among the people from generation to generation. The fact that they thus survive the attacks of time shows of itself that they represent the musical genius of the people among whom they are found. Thus the fine ballads of England, Scotland, and Ireland, the pibrochs of Scotland, the melodies for the harp of Ireland and Wales, the folk-songs of Germany, the dances for the violin of Hungary, or the music for the guitar and castanets of Spain, &c., are intensely characteristic of the nations themselves. All the northern nations are found by their national music to be by their original nature fondest of the minor mode:—

"Dark and true and tender is the North."

Other large national distinctions arise, as for instance in Scotland, with the curious "Scotch snap," a sort of reversed appoggiatura, the limited five-note scale so often used by the Scottish folk (patronized, too, in China), the irregular intonation of the bagpipe, even yet a puzzle to musicians, &c. If we go eastward we find the Arabs and other Orientals with a scale of altogether different intervals from our own; and the Siamese royal band, which performed frequently in London during the "Inventions and Music" International Exhibition, 1885, were even more "out-of-tune" to European ears than the Arabs. Of course our music is equally false in tuning to them.

Another national musical peculiarity is the character of the voices in which they excel. It is acknowledged that more deep basses exist in Russia than elsewhere, that England gives the finest contralto voices, while Italy produces most tenors, and France most light baritones, the latter being moreover either unable or unwilling for the most part to hold a note steadily, and singing therefore in a constant (and to most ears unpleasant) *vibrato*—a national fault from which as yet our English singers are happily free.

**MUSICAL BOX**, a mechanical musical instrument, the source of sound in which is "a comb," a flat plate of steel cut into teeth. The plate being wider and thicker at one end than the other, the teeth, when twitched, ring out a note of different pitch, the heavier teeth giving of course the lower notes. Just in front of the row of pointed tips of the teeth a barrel revolves, moved by clockwork, and on the face of the barrel metal pins are set, so that when a pin comes against the end of a tooth in the course of the revolution of the barrel, it will twitch it and put it into vibration. It is evident that by the suitable driving of these pins the barrel may be made to play any tune desired upon the comb. Chords and accompaniments to melodies are also in the range of the instrument, for any number of pins set along the same horizontal line in the cylinder will put their respective teeth into vibration simultaneously. When an entire revolution of the barrel is completed the tune is so arranged as to be completed also. If then the barrel be shifted a little to the right or left, the former pins will now escape the points of the teeth, passing between one tooth of the comb and the next, as the barrel revolves. New lines of teeth can therefore be set, and another tune becomes playable. A second shift gives place for another tune, and so on. The wider apart are the points of the teeth, the more tunes can be



pricked on the barrel. Additions of bells, of a drum, castanets, and other appliances of the sort, driven by the same clockwork, are often made, and small concertinas have been introduced whose bellows are blown in like way, so that sustained tones for sacred airs, &c., become possible. Large instruments, which essay to imitate an orchestra, worked by pinned barrels in the same fashion, are called *Orchestrions*, and the actions of modern *Carillons* of church bells are also merely developments of the musical-box barrel. The first musical boxes were toy snuff-boxes, and were in high favour in the last century. The headquarters of the manufacture is now at Geneva, which place indeed has almost a monopoly of the article.

**MUSICAL GLASSES.** See HARMONICA.

**MUSK-PRINTING.** See PRINTING.

**MUSK-DEER** (*Moschus*) is a genus of Artiodactyle Ungulates nearly allied to the true DEER (*Cervidae*), in which family it may be placed, though by some it is made the type of a distinct family, *Moschidae*. The musk-deer differs from the true deer in the absence of horns in either sex and of suborbital sinuses, and in the presence of a gall-bladder. The upper canine teeth in the males form long tusks projecting downwards and coming out between the lips; they are compressed and arched backwards, and sharp-pointed. Only one species of musk-deer is known, *Moschus moschiferus*, which inhabits the elevated plains of Central Asia, extending as far as the eastern provinces of China. It is about the size of the roebuck, but unlike that species stands much higher on the haunches than at the shoulder. The musk-deer is distinguished by the presence in the male of an abdominal glandular pouch, which is about the size of a hen's egg, and contains an unctuous brown secretion, which is the musk of commerce. The hair of the musk-deer is coarse and brittle; it is more or less brownish, the throat being white, with light bands on the sides of the neck; whitish-gray spots also occur along the lateral parts of the body. The ears are long and narrow. The feet are remarkable for the great development of the lateral pair of toes, the second and fifth. The tail is very short.

The musk-deer is solitary and almost nocturnal in its habits. It is shy, extremely active, and sure-footed. It feeds on the leaves and flowers of plants, on moss, grasses, &c. Its musk-secretion being a valuable article of commerce, this animal is subject to much persecution. The CHEVROTAINS (*Tragulidae*) were for long confused with the musk-deer, with which they have no special affinities.

**MUSK-DUCK** is a name applied to two distinct species of the family Anatidae or DUCKS. The musk-duck of America (*Cairina moschata*), improperly called Muscovy Duck, is not unfrequently seen in poultry-yards in England. It differs from the common duck in the character of its plumage, in the presence of an elevated tubercle at the base of the bill, in the space of naked skin extending from the beak and encircling the eyes, and in the absence of curled tail-feathers in the male. Nevertheless it breeds freely with the common duck, but the hybrids are sterile. It is a native of Guiana, Brazil, and other parts of South America. The plumage is lax, glossy black in colour, with the wing-coverts white, but in domestication the plumage often becomes more or less white. The skin exhales a strong odour of musk.

The musk-duck of Australia (*Piziura lobata*) is a very distinct species, belonging to the subfamily Eristaturinae or spiny-tailed ducks. The male is nearly twice as large as the female, and has a lengthened, stiff, leather-like appendage hanging from the under surface of the bill. It is a native of Australia and Tasmania, and frequents the bays and inlets of the sea, as well as fresh water. It possesses remarkable powers of diving.

**MUS-KET** (Ger. *muskette*; Fr. *mousquet*, from *mouchet*, a sparrow-hawk, it being customary in the middle ages to

name shooting implements after different species of hawks), the firearm introduced early in the sixteenth century as a weapon for foot soldiers. The first muskets or hand-cannon were fired by means of a lighted match conveyed by the hand to the touch-hole, the addition of a trigger contrivance for this purpose being designed about 1476, when the weapon was termed an *arquebus*. This in its turn gave way to the *mousquet*, which was so long and heavy that it required a rest or staff to support it when it was fired. Gustavus Adolphus reduced the weight of the musket to 10 lbs., so that the support might be dispensed with, and the weapon was greatly improved soon afterwards by the introduction of the flint-lock. This form of the musket remained the chief weapon of the infantry until the beginning of the present century, when the percussion lock was introduced. Flint lock muskets were used in the British army as late as 1840, and though these weapons have become entirely obsolete among civilized nations, they are still used in some parts of Asia and Africa to an extent sufficient to sustain a busy industry in flint-knapping in some of the districts on the east coast of England. The musket was superseded by the rifle about the middle of the present century, and an account of the latter weapon and its various developments will be found under RIFLE.

**MUSKETTOON**, a short musket with a very wide bore and a bell mouth like a blunderbuss, which threw a very heavy ball, and was used for fighting at close quarters. It is frequently mentioned in old histories, but as a weapon of war it has long been obsolete.

**MUSK-OX** (*Oribos moschatus*) is a remarkable ruminant, seeming to connect the sheep and goats with the oxen. The musk-ox inhabits the arctic regions of North America north of latitude 60°. It is a heavily-built animal, about the size of the small Highland cattle. The body is covered with long, rich, brown hair, reaching almost to the ground, and entirely concealing the short tail. The limbs are short and stout. The head is large and broad, and the ears are short and well-nigh concealed by the fur. The horns are remarkably broad at the base, where they closely approximate in the male, but are separated by a hairy interspace in the female. They are curved obliquely downwards at first, suddenly bending upwards again towards the tips. The first half of the horn is rough and light-coloured, but the remaining narrowed portion is smooth and black at the extremity. The forehead is convex, the face being prolonged forwards into a hairy muzzle. The musk-ox feeds on grass, lichens, and the tender shoots of the willow and pine. It is gregarious, and the herds frequent barren grounds near rivers during the summer, retiring into the woods in winter. They ran fast, and when hard pressed use their formidable horns against their assailants, not unfrequently, according to the Indians, killing wolves and bears. Both sexes exude a musky odour, with which the carcass after death is also tainted, rendering it very inferior food. In Pleistocene times the musk-ox existed in England and Northern Europe.

**MUSK-RAT** or **MUSQUASH** (*Fiber zibethicus*) is an American rodent belonging to the family Muridae, and nearly allied to the Voles (*Arvicola*). The musk-rat has a stout, thick-set body about a foot in length, exclusive of the tail, which measures 9 or 10 inches. The limbs are short. All the feet are partially webbed; there are five toes on the hind feet, while the fore feet have four and a rudimentary thumb. The tail is laterally compressed and nearly naked. The general colour is ruddy-brown above, darker on the head and back, and gray below; the tail is black. The musk-rat has a strong musky odour, diffused by the secretion of a large inguinal gland. The musk-rat is extensively distributed throughout North America, except in the southern alluvial districts, inhabiting marshes, lakes, or the grassy banks of sluggish rivers. It is an excellent swimmer and diver, but is awkward on land.

Its food is chiefly vegetable, consisting of the roots of aquatic plants and the like; but it also feeds on fresh-water mussels. It forms burrows in the banks, in which it spends most of the day, being chiefly nocturnal in its habits. Sometimes the musk-rats construct dome-like huts, composed of grasses and leaves cemented with mud, and raise them several feet above the surface of the water. The outlet of these huts is under water, and the interior is lined with dry grass. The fur has decreased in value as an article of commerce. The musk-rats are still, however, trapped and destroyed in large numbers, owing to the injury which they do to dams and embankments.

The name musk-rat is given in India to a species of shrew described as *Sorex caruleus*. The musky odour, which is due to large glands beneath the skin on the belly and flanks near the fore limbs, is so powerful that it impregnates everything over which the animal passes; and it is popularly believed in India that if it runs over a corked bottle of wine or beer it will infect the contents. This little animal is of a bluish-ash colour, and from 6 to 8 inches long. It is common in houses at night, feeding voraciously on insects.

**MUSLIN**, a thin cloth made of cotton. The name is supposed to be derived from Mosul. Until the early part of the present century all the muslin used in Europe was of the manufacture of India. Some of the muslins of India, and especially those of Dacca, are of the most astonishing degree of fineness, so as to justify their poetical description as "webs of woven wind." Such, however, has been the result of the mechanical inventions of England in this branch of industry, that not only are muslins of British manufacture now used at home, almost to the entire exclusion of those woven in India, but large quantities are exported to all parts of the world, and the cheaper kinds find their way even far into the interior of India. But although the introduction of machinery has so cheapened the article as to bring it within the reach of all classes, no European manufacturer has ever yet been able to rival the Dacca articles. A Manchester firm has, indeed, surpassed them in the excessive thinness of the yarn, but they have not been able to impart their peculiar delicate softness. The manufacture of muslins in Great Britain and France is very extensive, especially printed goods, in which the patterns are produced by the same processes as in calico-printing. Paisley and Manchester are the chief seats of the manufacture in Great Britain, and Glasgow houses still carry on a branch of the trade—viz. the working of sewed or embroidered muslin, but the trade is not so important now as formerly.

**MUSOPHAGIDÆ.** See PLANTAIN-EATERS.

**MUSPEL**, the giant of primeval flame in the Norse mythology, a Jotun, distinct from Loki, god of fire, who was an Ase. The sons of Muspel, that is, flames, were led to set the universe on fire in the final overthrow of the gods, not by Muspel but by Surtur, the giant of smoke, from whose dark hand flashed out a tongue of flame for a sword. Up to that catastrophe the sons of Muspel dwelt in Muspelheim, and were known to be there only by their intermittent glow. The relation of Muspel to Loki may be paralleled by that of Hyperion to Apollo in the classical mythology.

**MUSQUASH.** See MUSK-RAT.

**MUSSEL** (*Mytilus*) is a genus of molluscs belonging to the order LAMELLIBRANCHIATA, and forming the type of the family MYTILIDÆ. The Common Sea-mussel (*Mytilus edulis*) is the best-known species. The shell is wedge-shaped, with two equal valves, closed, rounded behind, with the beaks anterior, terminal, and pointed. The animal secretes a strong coarse *byssus* or beard, an assemblage of small silky threads, by which the mussel attaches itself to rocks, &c., with such tenacity that not even a tempest can shake its hold. Sea-mussels frequent mud banks

which are uncovered at low water; they are very prolific, and attain their full growth in a single year. Though less highly esteemed than the oyster, immense quantities are consumed as food every year. Though generally wholesome, the mussel occasionally produces violent and even fatal effects in those who partake of it, especially in summer. Owing to this deleterious character, the cause of which is still a matter of conjecture, this mollusc is not so much used for food in Britain as on the Continent. It is, however, used very largely as bait, especially in the cod and haddock fisheries. Mussel culture is carried on to a very large extent at the mussel farms at Aiguillon, on the west coast of France, where the rearing of mussels has formed for some hundreds of years a very extensive and profitable business. As food mussels are principally used in the large towns of the manufacturing districts. From the Frith of Forth it has been calculated that 30,000,000 or 40,000,000 are collected for the deep-sea fishery. So scarce have they become that quantities are imported from Hamburg and Holland, and at Montrose they are cultivated.

About seventy species of *Mytilus* have been described, world-wide in their distribution, and there are 100 fossil species, from the Silurian downwards. The Horse-mussels (*Modiolar*) are chiefly tropical. They differ mainly from the *Mytili* in the position of the beaks and in their habit of burrowing or spinning a kind of nest, in which they occasionally conceal themselves. They range from low water to 100 fathoms. The Date-shells (*Lithodomus*) also belong to the family *Mytilidæ*. They are remarkable for boring into corals and even hard limestone rocks. The ruined temple of Serapis in the Bay of Naples gives evidence of the extent of the boring powers of the *Lithodoni*.

**MUSSELBURGH**, a royal burgh and seaport of Scotland, in the county and 6 miles east of Edinburgh, situated at the embouchure of the Esk, on the Frith of Forth, handsomely and substantially though irregularly built; it is connected by three bridges, one supposed to be of Roman erection, with the suburb of Fisherrrow. The river is also crossed by a railway viaduct. There are two parochial churches, an Episcopal church and chapel, a Roman Catholic church, a Free church, two United Presbyterian churches, and a Congregational church; a grammar school, an old cross, an ancient tolbooth, built with the ruins of Loretto chapel; and a handsome town-hall. The harbour is dry at low water. There are some manufacturing industries, including cotton goods, leather, sailcloth, nets, twine, and paper; and iron work, seed crushing, and glue-making employ many of the population. The Links are well known as golfing and horse-racing grounds. Population of the parliamentary burgh in 1881, 7866. The name Musselburgh is said to be derived from a mussel bank at the mouth of the Esk. The chapel of Loretto, to the east of the town, was, before the Reformation, a place of great importance; pilgrimages were often made to it, and in 1530 James V. performed a pilgrimage thither on foot. About half a mile south of Pinkie House was fought, on the 10th September, 1547, the battle of Pinkie, in which the English, under the Duke of Somerset, totally defeated the Scotch. The battle of Prestonpans, on 21st September, 1745, between the forces of Charles Edward and the royal army, took place in this neighbourhood, when the latter were completely defeated.

**MUSSET, ALFRED DE**, the only modern French poet whose genius can bear comparison with that of Victor Hugo, was born at Paris in 1810. While yet a boy he ardently embraced the pursuit of literature, under the auspices of Hugo and his circle of "Romantics." When only nineteen he published his "*Contes d'Espagne et d'Italie*," and at once was recognized as a true genius of the first order. Never were such wonderful gifts so abused, so grand a soul fitted with such a contemptibly weak nature. De Musset fell under the glamour of the great novelist

Georges Sand, with whom he travelled for some time in Italy. Madame Dudevant treated him as she did the rest of her lovers, even to putting him at last into a book ("Elle et Lui"), and he became very wretched when her affection forsook him. He had previously been extremely dissipated, and he now took to unlimited absinthe. Offers from booksellers were showered upon him, the government itself offered him pleasant and lucrative posts; every one tried to save him, but the miserable man threw himself away, drowned himself in the wormwood spirit, and died in 1857. He was elected to the Academy in 1852, but he wrote nothing of value after he was forty.

De Musset's work is more like Byron's than that of any other poet whatever; the temperament of the two men was very similar. He is as careless as Byron of mere form also. His poems are almost all quite short, but perfect gems. He excels his English rival in earnestness; his melancholy is genuine and not in the least theatrical, which certainly cannot always be said of Byron. His prose works, beyond a few critical articles on music and painting, are composed of some exquisitely written novelettes, the finest of which are "Mimi Pinson" and "Frédéric et Bernerette," truly charming in workmanship, but each of them, as has been said, "dug out of the heart of a woman." A pendant to these is his powerful autobiographical work, where under the title "Confessions d'un Enfant du Siècle," his own wasted, morbid existence is figured with the accuracy and the painful fascination of an anatomical dissection. His most original and most delightful work, however, is dramatic, and rather in the shorter pieces than in the few regular comedies which he has written. The proverbs, *Il ne faut jurer de rien, Il faut qu'une porte soit ouverte ou fermée*, &c., are absolutely unrivalled on the French or any other stage. They are unique in art. Their delicacy, evanescent as a subtle perfume; their wit, fine as a rapier point, are as fresh and as piquant to-day as when they were first written. They are in constant favour with the cultured artists of the Comédie Française, and in still greater favour with readers of fastidious taste. Had De Musset studied, had he worked without studying, or had he even lived a quiet life, and thus kept himself able to write when his genius bade him, in all probability we should have had a dramatist equal to Molière. As it is, the contrast between what he ought to have been and what he was, is among the saddest things in literature.

**MUSTARD** (*Sinapis*), the name of a genus of plants belonging to the order **CRUCIFERÆ**. All the species are known by the name of mustard, a word derived from *mustum ardens*, in allusion to their hot and biting character. They are chiefly natives of the temperate parts of the Old World. Two species are well known and much cultivated in this country, *Sinapis nigra* and *Sinapis alba* (the black mustard and white mustard.)

*Sinapis nigra* (the black mustard) is found in cultivated fields, waste grounds, and roadsides throughout Europe. The young plants of both black and white mustard are eaten as salad, and are both cultivated for this purpose. The black, however, differs from the white mustard in the flowers and seed being much smaller, and in the latter being black. But the great purpose for which the black mustard is grown is for the seeds, which when ripened and powdered form the well-known condiment. *Sinapis alba* (white mustard) is a native of Britain and most countries in the south of Europe. It is frequently cultivated, and when young is eaten as a salad. Its seeds are white, and by expression yield an insipid oil.

The chemical constitution of black mustard is of the most complex kind. It contains myronate of potash (sinigrin), an albuminoid body, myrosin, fixed oil, a pearly fat matter, gummy matter, sugar, colouring matter, sinapisin, free acid, peculiar green matter, and some salts, chiefly sulphate and phosphate of lime. Myrosin, when mixed

with cool water, acts as a ferment on sinigrin, and develops the essential oil of mustard.

The fixed oil is perfectly bland, like that of olive or rape, which last it greatly resembles. It exists to the extent of 20 per cent. in white mustard seed, and about 28 per cent. in black mustard seed. To obtain it the seeds are crushed in a mill or between rollers, and the skins should be subjected to pressure as well as the farina or flour. The cake may then be sifted and reduced to a fine powder, as it retains all the pungent properties.

**Medicinal Uses of Mustard.**—Pure flour of mustard is frequently used in medicine as a convenient emetic, a teaspoonful stirred up with half a pint of warm water and drunk at a draught being generally sufficient to evacuate the stomach of its contents. As it is always at hand, it forms a valuable remedy in cases of accidental poisoning. An infusion of mustard made by steeping a teaspoonful of mustard flour in a teacupful of boiling water for twenty minutes and then straining, forms also a useful draught in cases of obstinate hiccup. Externally mustard is used as a counter-irritant, and the poultice made by mixing equal parts of mustard flour and linseed meal with a little hot water forms a most useful application in cases of bronchitis, pleurisy, inflammation of the lungs, and for the relief of neuralgic pains, spasms, or colic. Rigollot's mustard leaves, made by spreading moistened mustard on paper and drying, are a very convenient and cleanly form of the mustard poultice. The compound liniment of mustard is a stimulating liniment which derives its chief acting properties from the oil of mustard it contains. This oil, which is prepared from the seeds of the black mustard, is a powerful irritant, and when applied to the skin produces almost instant vesication. The flour of mustard added to a foot bath is sometimes employed to cut short a cold, to relieve headache, and to arrest the progress of internal inflammation. Formerly mustard seed was freely administered as a remedy for some forms of indigestion, but the practice has now fallen into disuse.

**MUSTELIDÆ** is a large family of digitigrade **CARNIVORA**, containing the weasels, martens, badgers, and otters. The Mustelidæ are remarkable in general for their long, slim, worm-like bodies, which, together with the noxious qualities of some of them, fully entitles them to the name vermin. The limbs are short, the feet have five toes, and the claws are not retractile, as in the cat family, Felidæ. There is a single true molar tooth in the upper jaw on each side, and two in the lower. Anal glands are usually present beneath the root of the tail, secreting an offensive fluid. The Mustelidæ have a very wide distribution, being found in all parts of the world except the West Indies, Madagascar, and Australia and its adjacent islands; they are especially abundant in the northern temperate regions. Most of the Mustelidæ are valued for their furs, especially the sable and ermine. This family is divided into three subfamilies—*Lutrinæ*, containing the otters; *Melinæ*, containing the badger, skunk, tealdu, and ratel; and *Mustelinæ*, containing the marten, weasel, polecat, ferret, mink, and glutton. See Plate.

**MUTE** is the designation of a certain class of sounds in speech produced by the momentary cutting-off of the stream of breath, so as to release it again and let it go free with a certain explosive force. In the English language this is only done in three ways, by the closure of the lips, as in *p* (labial), by the tongue when its point is pressed against the back of the teeth, as in *t* (dental), and by the tongue again when its middle is raised against the palate, as in *k* (palatal or guttural); these three, *p*, *t*, *k*, are the true mutes, the *surd mutes* in our tongue. Besides them there are their sonant modifications, the *sonant mutes*, *b*, *d*, *g*. In the latter there is not a complete closure followed by an explosion, but the tone of the voice is permitted to continue up to the final (modified) explosive sound, by means of a small quan-

tity of air forced up by the lungs into the pharynx and mouth, which is, however, soon exhausted, as experiment will easily show. In fact the sound of *p* begins after the lips separate, and the sound of *b* before they separate; and so with the others. Closely allied to the mutes are the nasals *m*, *n*, *ng*—respectively answering to *d*, *b*, *g*—where the voice is allowed a passage through the nose though denied an issue by the mouth. Finally, if the breath be allowed to pass immediately after *p* or *b*, we get the aspirated mutes *ph*, *bh* (as in the Irishman's *bhoy* for boy).

**MUTE** (Lat. *mutus*), a dumb person. Dumbness is a very rare affliction, as is shown in our article DEAF AND DUMB. Mutes are dumb simply because they cannot hear, and therefore have no inducement nor guide to the use of the voice. The modern plan of teaching the deaf to speak and to perceive the speech of others with the eye in return, relieves deafness of half its misery. Professor Graham Bell (inventor of the telephone) has studied the subject closely, and in an elaborate Memoir (1883) he shows that more than half the deaf-mutes have deaf-mute relatives, and also that of those who marry 80 per cent. now choose partners similarly afflicted with themselves. The result is a rapid increase of deaf-mutes, since all peculiarities tend to perpetuate themselves when fostered. The remedy would appear to be in the annihilation of the finger language of these afflicted friends, and their absorption into the general mass of the people, instead of the present custom of massing them together in large societies.

The horrible custom of cutting out the tongue from negro slaves in positions of great confidence, lest they should betray secrets, was in the middle ages not uncommon with Eastern monarchs. Such mutes figure in the "Arabian Nights" and similar sources of information in a somewhat important manner. It is to be hoped that the barbarous custom, though certainly not yet extinct, is destined soon to die out.

**MUTE** (Lat. *mutus*), in Turkey, a dumb officer of the sultan's household, who acts as the executioner of any person of rank condemned to death by the sultan. In England, the term is applied to persons employed by undertakers to stand before the door of a house where a corpse is lying for a short time previous to the funeral. It is a survival of the old Roman custom, where lictors, with shrouded faces, accompanied in solemn silence the funeral of the Roman noble to the bier whereupon the body was to be burnt.

**MUTE**, in law, is a person who refuses to plead to an indictment. Formerly he was compelled to plead by the application of torture, but by statute 12 Geo. III. c. 20, it was enacted that a person refusing to plead was to be considered guilty; and by 7 & 8 Geo. IV. c. 48, the court may order a plea of not guilty to be entered for him.

**MUTE** (Ital. *sordino*), a contrivance for checking the vibrations of musical instruments. Mutes for violins and violoncellos are made of wood or brass, shaped somewhat like a comb, with very broad teeth split lengthwise, so that the mute, when thrust down on to the bridge, may clip it with these split teeth in the intervals between the strings. The bridge thus clipped and weighted no longer transfers the vibrations of the strings freely to the soundboard, and a peculiar thin, weak, rather unpleasantly nasal sound takes the place of the ordinary sonorous tone. It is not only a *piano* which is obtained, but a tone of a different "colour," and muting is resorted to by composers quite as much for this peculiar effect as for obtaining very soft sounds. It is not nearly so much in use now as formerly. At a push players who have left their mutes at home make a very fair substitute of a penny passed in and out the strings beyond the bridge. Horns are muted by leather pads of a pear shape inserted in the bell. The effect is sweet and "distant," but the intonation is affected to some degree, and care must be taken or the instrument will be out of

tune. Clarionets are muted (but by Berlioz almost alone among composers) by a bag being tied round their bells.

**MUTINY ACT.** See ARMY, BRITISH.

**MUTULE**, one of the features in a cornice in the Doric order of Greek architecture. The mutules are slabs of marble, which appear to support the cornice, and no doubt represent the ends of the rafters of the original timber roof. See GREEK ARCHITECTURE.

**MY'A.** See CLAM.

**MYCENÆ**, an ancient town and state of Greece, in Northern Peloponnesus, which in the time of its king, Agamemnon, was the most powerful state of Greece. The small kingdom of Argos was then subject to it, but later Argos gained the ascendancy. After the campaign against Xerxes, the Argæi, being joined by the people of Tegea and Cleonæ, attacked Mycenæ, which they razed to the ground, B.C. 468. Part of the inhabitants were made slaves, the rest emigrated, and according to Strabo Mycenæ did not again rise from its ruins. These ruins, however, which are very remarkable and of great magnitude, have been excavated and explored by Dr. Schliemann, who has been enabled to throw considerable light, not only upon some Homeric traditions concerning the place, but upon its history subsequent to 468 B.C. Dr. Schliemann considers it proved by facts that the city was rebuilt about B.C. 400, and again about B.C. 200. Numerous rock-cut tombs were found, of immense size, and near them the so-called "treasuries" of the kings containing works of art in the shape of carvings, vases, &c., together with a quantity of jewels and articles worked in gold. The tomb, and even the body of Agamemnon was said to have been discovered, but identification rests on somewhat slender evidence. It would appear fairly established, at all events, that some thousand years or so before the Christian era, Mycenæ was the seat of a race of monarchs, both wealthy and powerful, and of a local art which, though in the main barbarous, was not without merit.

**MYCETES.** See BOWLER.

**MYCOSE** or **TREHALOSE**, a sugar obtained from ergot of rye, also found in Trehala manna. It crystallizes in rhombic prisms, having the formula  $C_{12}H_{22}O_{11}$ . It is dextro-rotatory, and is fermentable. Boiling with dilute sulphuric acid converts it into dextro-glucose.

**MYGALE** is a genus of spiders, the type of the family Mygalida. This family is distinguished by the presence of four lung-sacs and stigmata, and only four spinnerets, of which one pair is very small, while there are eight ocelli. The species of the genus *Mygale* are for the most part of gigantic size, with hairy bodies and legs, and inhabit the West Indies and tropical America. Some of the species form tunnels in the earth, but most make silken nests under stones, or in clefts of trees and other sheltered crevices. One of the species, the Bird-killing Spider (*Mygale aricularia*), owes its name to the account given by Madame Merian of its killing small birds. This has been fully confirmed by Mr. Bates ("Naturalist on the River Amazon"), who found in the web two small finches, one dead, the other lying under the spider's body smeared with its saliva and almost lifeless. Some of these gigantic spiders are over 2 inches long, and their legs cover a surface of 6 or 7 inches. The hairs with which the body and legs are clothed readily break off if the animal is handled, and getting beneath the skin, cause a maddening irritation. The Trap-door Spider (*ATYPUS*) is the only British representative of the family.

**MYL'ODON** is a genus of gigantic fossil edentates, closely allied to the extinct *MEGATHERIUM* and the recent sloths. Mylodon is found in the Pleistocene deposits of South America. It closely resembled megatherium in habit and general structure. The teeth are eighteen in number, five upper and four lower on each side; they are long, simple, fangless, and have flat crowns. The fore feet have

five toes, the hind feet four, the two external digits being nailless. The mylodon is thought to have lived on the leaves and tender shoots of trees, which its immense strength and the arrangement of its lower limbs enabled it to uproot and level to the ground. This it did by first scratching away the soil from the roots, and then embracing the trunk with its fore feet. Professor Owen considers that the mylodon had a largely developed tongue for stripping off the foliage. The best known species, the *Mylodon robustus*, measured 11 feet from the fore part of the skull to the end of the tail.

**MYOPIA** or **SHORT SIGHT.** See **SIGHT.**

**MYOPORINÆ** is an order of shrubs or trees with axillary flowers, distinguished from **VERBENACEÆ** chiefly by having two seeds in each cell of the ovary and by the superior radicle. Myoporinæ are chiefly shrubs of little interest, inhabiting the Australian regions and other parts of the southern hemisphere. The most remarkable thing connected with them is the presence of cysts of oil in their leaves, which thence have a dotted structure. This order belongs to the Lamiales, a cohort of the **GAMOPETALÆ.**

**MYOSIN**, the solid constituent of muscle, closely comparable to the globulins, such as the fibrino-plastin and fibrinogen, whose union forms the fibrin of the blood. It is believed not to exist as such, but only in its elements, in living muscle. The exact chemical constitution of myosin is not yet determined to any great nicety; an approximation is the following:—Carbon, 53; hydrogen, 7; nitrogen, 16; oxygen, 22; sulphur, 1; phosphorus, a trace. Myosin forms a sort of middle term between globulin, such as that obtained from the crystalline lens of the eye, and the fibrin of the blood; myosin is, in fact, a more soluble form of fibrin, deposited not in threads or filaments, but in clumps and masses. See **FIBRIN.**

**MYOSOTIS** (Forget-me-not or Scorpion-grass), a genus of plants belonging to the order **BORAGINÆÆ.** The species are annual or perennial, rough or smoothish plants, with blue flowers with terminal racemes, which are revolute before expansion. The species inhabit the more temperate parts of Asia, Africa, and America, and are found abundantly in Europe. Eight species are found in Great Britain. *Myosotis palustris* (forget-me-not) is a native throughout Europe, and also of Asia and North America. In Great Britain it is found in humid meadows, bogs, banks of rivers, rivulets, and ditches. This plant has a large bright blue corolla with a yellow eye. A variety is described with white flowers. The following are the remaining British species of this genus:—*Myosotis repens* (mouse-ear) is found in boggy places; *Myosotis carpitosa* is found in watery places; *Myosotis alpestris* is found on the summits of the Breadalbane Mountains and in Teesdale; *Myosotis sylvatica* is found in shady places, but is rare; *Myosotis arvensis* (field scorpion-grass) grows in cultivated land and thickets; *Myosotis collina* is found on dry banks; *Myosotis versicolor* has small flowers, at first pale yellow, afterwards blue; it is found in meadows and on banks. None of the species are used in medicine or the arts. The British species are most desirable for cultivation, especially *Myosotis palustris* and *repens*.

**MYRIAPODA** is a class of **ARTHROPODA**, containing the centipedes and millepedes. The myriapods are low members of the subkingdom Arthropoda, presenting in some respects a close resemblance to the annelid worms. The body is long, cylindrical, or more or less flattened, composed of segments which are often numerous, and, with the exception of three or four of those at the anterior extremity, are precisely alike. Each segment bears pointed appendages; in the millepedes, from the fifth downwards, each segment bears generally two pairs of appendages. The head closely corresponds with the same part in insects. The antennæ are bristle-like or thread-like. The mandibles (Plate, figs. 4, 7, c) differ from those of insects in

being jointed. In the centipedes the fourth pair of appendages (fig. 7, f c) form the formidable poison-claws. The ventral nerve-cords extend the whole length of the body, and form a ganglion in each segment. Eyes are present in the form of ocelli; in one genus (*Scutigera*) they are compound. The alimentary canal is usually simple and straight, consisting of œsophagus, intestine, and rectum; at the junction of the two latter are two or four Malpighian tubules. There is a many-chambered dorsal heart (fig. 8 c), extending throughout almost the whole length of the body, and attached to the dorsal wall by alary muscles (*m*); near the head the blood is driven into arteries (*ar*). Respiration is by means of air-tubes or *tracheæ*, receiving the air from the exterior by paired slits or *stigmata*, found on almost every segment. The sexes are distinct. The females are larger than the males, and lay their eggs in earth. The young undergo no real metamorphosis comparable to that of insects.

The class Myriapoda is divided into two orders—**Chilopoda** (**CENTIPEDES**), and **Chilognatha** (**MILLEPEDES**). In the accompanying Plate, figs. 1 to 5 belong to the Chilognatha, and figs. 6 to 8 to the Chilopoda. Figs. 4 and 7 illustrate the structure of the head and the organs of the mouth in *Iulus* and *Scolopendra* respectively. In *Scolopendra* the antennæ (fig. 7, A, b b) are many-jointed, while in *Iulus* (fig. 4, A, c c) they consist of few joints. *n* to *r*, in both figs., show the various organs of the head; *b* showing the labrum or upper lip, *c* being the mandibles, *n* the maxillæ, *e* the third post-oral appendages, and *r* the fourth, forming the poison-claws (*a*) of *Scolopendra*. *c*, in fig. 4, shows the normal legs in *Iulus*, denoted by *c* and *d*, fig. 7, A, in *Scolopendra*. Peripatus (figs. 9, 10) is a remarkable arthropod, which, though related to the Myriapoda, is generally considered, in the light of Professor Moseley's observations, sufficiently distinct to form a separate class, Peripatidea or Protracheata. Fig. 10 (after Moseley) shows the anatomy of a female Peripatus—*a*, antennæ; *cy*, cerebral ganglia, and the widely divaricated nerve-cords (*rv*); *x*, fat bodies; *sg*, slime glands; *ph*, pharynx; *st*, stomach; *an*, anus; *ov*, ovary; *od*, oviduct; *ut*, uterus; and *tr*, the tracheæ scattered on the inner surfaces of the reflected walls. See **PERIPATUS.**

**MYRICA/CÆ** are plants constituting a very small order of **MONOCHLAMYDÆÆ**, with separate sexes. They are common in the temperate parts of the world, especially in North America and the Cape of Good Hope. With us the only species is the Sweet Gale or Box-myrtle (*Myrica Gale*). It is a bushy plant, about 4 feet in height; the catkins are sessile and erect; the fruit is covered with resinous glands, and the leaves are fragrant when bruised. The species are all more or less fragrant and aromatic; and one of them is called *Myrica cerifera*, or the wax-bearing, from the dupes being covered with a waxy secretion, which may be readily separated and manufactured into candles, whence has arisen its popular name of candleberry myrtle or wax myrtle. It is a native of woods in the United States. The bark of the root of this plant is acid and astringent; in large doses it produces vomiting, accompanied by a burning sensation in the throat. It is used as a stimulant and astringent. The wax of the fruit is collected and purified, and used as a substitute for bees-wax and for making candles.

In this order the unisexual flowers have no perianth. The male flower has from two to eight stamens, with two bractlets. The female flower has a one-celled ovary with two styles; the ovule is solitary, erect, orthotropous; the seed is without albumen and with a superior radicle. See **COMPTONIA, GALE.**

**MYR'ICIN**, the part of bees-wax insoluble in alcohol. It is a palmitate of myricyl ( $C_{46}H_{92}O_2$ ). It melts at 64° C. (147° Fahr.) When saponified by potash it yields palmitic acid and hydrate of myricyl. Hydrate of myricyl

melissic alcohol ( $C_{30}H_{62}O$ ) is crystalline, and sublimes unchanged.

**MYRIS'TIC ACID** is obtained from the oil or butter of nutmeg (*Myristica moschata*, natural order Myristicaceæ), in which it exists as myristin or myristate of glyceryl. It is also found in spermaceti, in cocoa-nut oil, in common butter, and in some other fatty bodies. It crystallizes in shining scales from boiling alcohol, in which it is soluble. It is quite insoluble in water and in ether. It melts at  $53^{\circ} C.$  ( $127^{\circ} Fahr.$ ) It is monobasic, and forms a large series of salts known as myristates. The formula is  $C_{14}H_{26}O_2$ . The myristate of potassium ( $C_{14}H_{27}KO_2$ ) is a crystalline soap soluble in water and alcohol, but insoluble in ether.

**MYRIS'TIC ALCOHOL** or **METHAL** ( $C_{14}H_{30}O$ ) is found in spermaceti. Myristic ether, or myristate of ethyl, is crystalline.

**MYRIS'TICA** (*moschata*), a tree native of the Molucca Islands, especially of Banda, but cultivated in Java, Sumatra, and elsewhere in the East, and of late years in Guiana and several of the West India Islands. It yields nutmegs and mace, the best of which are produced in the first-mentioned islands. The fruit is of the size and form of a peach, and, when ripe, the fleshy part separates into two nearly equal halves, exposing the kernel surrounded by an aril, the former being the nutmeg, the latter the mace. The odour of mace is strongly aromatic; the taste aromatic, but sharp and acid. It contains both a fixed oil (in small quantity)

and a volatile oil. A pound of mace yields by distillation an ounce of volatile oil. The fixed oil is not an article of European commerce, and what is termed the expressed oil of mace is obtained from the nutmeg and should bear its name. An inferior mace is obtained from various species of Myristica. The properties of mace are similar to those of the NUTMEG.

**MYRISTICA'CEÆ** are tropical, fragrant, aromatic trees, with an astringent juice. The nutmeg of the shops, which is the seed of *Myristica moschata*, and the mace are the only products of the order employed officially. Other species bear fruit which may be employed as a substitute, but they are all inferior to the real Oriental myristica. The Myristicaceæ belong to the MONOCHILAMYDEÆ. The flowers are unisexual, with a three-parted perianth; the male flowers have three to twelve stamens, with combined filaments. The female flowers have a one-celled ovary of several carpels, and one erect seed enveloped in an aril; the embryo is small at the base of the ruminated albumens.

**MY'RISTIN**, or **MYRISTATE OF GLYCERYL** ( $C_{45}H_{10}O_6$ ), is found in nutmeg oil. It is crystalline, soluble in ether, less soluble in alcohol, and insoluble in water.

**MYRMECO'BIUS** is a genus of marsupials belonging to the family Dasyuridæ, of which only one species is known, *Myrmecobius fasciatus*, from Southern and Western Australia. The banded myrmecobius is remarkable for



The Banded Myrmecobius (*Myrmecobius fasciatus*).

having more teeth than any other mammal, except some of the cetaceans and edentates; there are fifty-two in all, namely, eight upper and six lower incisors, four canines, six premolars above and below, ten molars in the upper jaw and twelve in the lower. The fore feet have five toes, armed with strong, compressed, curved claws, serviceable for digging; the hind feet have only four toes. The myrmecobius is about the size of a rat, but resembles somewhat a squirrel, having a long bushy tail. The head has a long pointed muzzle; the ears are of moderate size and somewhat pointed. The general colour of the body is red, with white transverse band over the crupper. The fur is coarse and bristly. There is no pouch, the young, five to nine in number, being protected by the long hair of the abdomen. The myrmecobius lives entirely on the ground, feeding on insects. As it possesses a very long extensile tongue, and is always found in the vicinity of ant-hills, it is probably a marsupial ant-eater, though

direct evidence is wanting. Amphitherium, a fossil mammal, described from a lower jaw found in the Stonesfield slates of the Oolites, is considered by Owen and others to resemble nearly Myrmecobius.

**MYRMECO'DIA** is a genus of plants belonging to the order Rubiacæ. They are small shrubby plants, growing in the forks of trees, but are not parasitic in the sense of feeding on the juices of their hosts. They consist of a large bulbous portion, whence the rootlets spring, and an upright stem with leaves and flowers. The bulb is honey-combed with galleries, which are inhabited by a particular species of ant. Kumphius, who during the last century described so many of the wonders of the Malayan Archipelago, called it a living ant's nest, and appeared to think that it sprang into being by spontaneous generation. Beccari, a few years ago, described its growth from the seed, and came to the conclusion that not only the galleries but the bulb itself were due to the action of the

ants. He supposed that the bite of an ant at the root-end of the seedling first caused the swelling round the pierced portion, that the ants continued their attentions, continually clearing out decomposed matter from the original hole, and excavating deeper and deeper as the bulb grew, stimulated by the injury, just as galls are caused by the stings of insects. He conjectured also that the seedling would die if the ants did not bite it. Thus the ants, according to him, depended on the plant for their nest, and the plant owed its very life to the ants. Mr. H. O. Forbes, in his very interesting work, "A Naturalist's Wanderings in the Eastern Archipelago" (1885), states that he grew the plants from seed, carefully excluding ants, and yet the bulbs enlarged and galleries were formed "partially full of a spongy substance, looking like its own degenerated tissue." Dr. Treub of Java has, since Mr. Forbes' observations, shown that the galleries are the result of a transformation into cork of the cells of the plant, which then dry up into a dusty matter, and can be easily removed by the ants. Mr. Forbes says that "the flowers are produced in deep spine-protected pits on the axis surmounting the bulb, and are remarkable for the extreme rapidity with which the cycle of their functional changes is performed. The pellucid white flower appears, and is followed by an orange watery fruit, whose seeds ripen and often germinate in the little pits where they grow, all within the space of thirty-six hours."

**MYRMELEON.** See ANT-LION.

**MYROBALAN** is the name given to the fruits of several species of *Terminalia*, a genus belonging to the order COMBRETACEÆ. These species are trees or shrubs, natives of the East Indies, where the astringent fruits are largely used for dyeing and tanning. They are also imported to this country for the same purposes, especially for the production of a permanent black by calico-printers.

**MYRON** (the Latin form of the Greek *Murôn*), one of the most celebrated sculptors of ancient Greece, was born at Eleuthera in Boeotia, about 480 B.C. Murôn was the fellow-pupil of Poluklétos (Lat. *Polyclethus*) under Agoladés: he was therefore in the prime of life at about the time that Pheidias died; and he resided, at the height of his fame, in Athens at the commencement of the Peloponnesian War. The *Piskobolos* or Quoit-thrower, by Murôn, was one of the most celebrated works of ancient art. The original was in bronze, but there are still several ancient copies of it in marble, though not one entire—one in the Campidoglio, one in the Vatican, and a third in the Villa Massimi at Rome; that in the British Museum was found in the villa of Hadrian, near Tivoli, in 1791. His statue of a lowing cow was even more renowned. We have many epigrams upon it. It stood in Athens in an open space down to the time of Cicero, who speaks of it. It was afterwards removed to Rome, where Prokopios saw it. It is most unfortunate that not a trace of this famous work has yet been found.

**MYRONIC ACID**, an acid found in black mustard seed, in which it exists in combination with potassium. It is also present in horse-radish. The pungent volatile oil of black mustard, which is sulphocyanate of allyl ( $C_4H_5N(O)$ ), does not exist in the seed, but is formed by the action of myronic acid on myrosin. Myronic acid is an uncrystallizable syrup, soluble in water and alcohol, and having the formula  $C_{10}H_{19}NS_2O_{10}$ . It forms a number of crystalline salts called myronates; these are all inodorous, but are decomposed by myrosin, forming the oil of mustard. Myronate of potassium ( $C_{10}H_{18}KN_2S_2O_{10}$ ) is found in black mustard seed and in horse-radish. It crystallizes in silky needles.

**MYROSIN**, an emulsin found in the seeds of black and white mustard. It is also found in the seeds of the radish, cabbage, turnip, and other cruciferous plants. It is an albuminous substance, soluble in water, and precipitated from the aqueous solution by alcohol. It has the

peculiar property of acting as a ferment on the myronate of potassium, contained in the mustard seed, and splitting it up into sulphocyanate of allyl, or volatile oil of mustard, glucose, and potassium sulphate, according to the following equation:—



**MYROX'YLON** is a genus of trees growing in tropical America, and producing BALSAM. The earliest mention of Peru balsam is made by Nicolas Monardes in 1565; he calls it simply *balsamo*, and says that it is the produce of a tree growing in New Spain, and called by the Indians *zilo*. He mentions two modes of procuring the balsam—one by incision into the rind of the stem, the other by boiling the branches in water; and he afterwards notices its physical properties and valuable medicinal qualities. Francisco Hernandez, a Spanish physician and naturalist, who resided from the year 1593 to 1600 in Mexico and New Spain, notices four balsam trees. Of these one appears to be identical with the tree which yields balsam of Peru; a copy of Hernandez's drawing of it is subjoined (fig. 1). He states that the Indian balsam tree—*arbor*

Fig. 1.

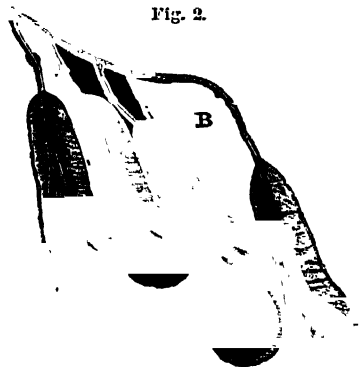


*balsami Indici*—is called by the Mexicans *hoitziloxitil*, because it abounds in resin. He describes it as being of the size of a lemon tree, and having leaves which are larger than those of the almond, but rounder and more acuminate. The flowers are yellow, and are placed on the summits of the branches. The seeds are whitish, oblong, somewhat contorted, and lodged at the extremity of the



oblong shells or fruits, which are longer and broader than the leaves. The tree, he says, was cultivated by the Mexican kings in the Hoaxtepec gardens. He also states that the seeds yield by pressure an oil which resembles in flavour and odour that obtained from bitter almonds and peach kernels. After the death of Linnæus, who had always been particularly anxious to ascertain the plant which yields this balsam, Mutis sent to the younger Linnæus specimens of the leaves and flowers of a plant which, he said, yielded balsam of Peru; subsequent investigation has, however, proved this statement to be erroneous. The balsam it produces is more like balsam of Tolu. A description of this plant was published, and the name of *Myroxylon Peruiferum* was given to it.

Fig. 2.



*Myroxylon Pereiræ* is the tree which produces the original balsam of Peru. It grows only in Central America, and the balsam was at first imported by way of Peru, hence the mistake in the name. Fig. 2 shows a fruit-bearing branch.

The principal part of the balsam resides in the two receptacles or *ritts* of the fruit, one placed on either side of the seed; but if a transverse section of the fruit be examined by the microscope, numerous receptacles of the more or less dried balsam are perceived in all parts of the mesocarp. In the two larger receptacles the balsam is usually found in the liquid state; but sometimes the walls of the receptacles are lined with the crystallized balsam. Fig. 3 is a cross section of the fruit and seed, magnified—*a a*, epicarp; *b b*, mesocarp; *c c*, endocarp; *d d*, large vittæ or lacunæ, containing balsam; *e e*, cotyledons.

Various medicinal products are obtained from the tree. By making an incision in the trunk of it a liquor exudes called the black balsam, an admirable remedy for effecting the speedy cure of wounds of every description; from the flowers the spirit of balsam is made; the seeds or nuts produce the oil of balsam, an excellent anodyne; and the capsules yield the white balsam. Balsam of Tolu is obtained from *Myroxylon Toluifera*, a tree which is very closely related to *Myroxylon Pereiræ*. It is a native of Venezuela and New Granada.

**MYRRH**, a gum-resin, celebrated from all antiquity for its aromatic and fragrant properties, is yielded by various species of *BALSAMODENDRON*, especially by *Balsamodendron Myrrha* and *Balsamodendron Katuf*. Myrrh exudes from the bark, and is at first soft, oily, and of a yellowish-white colour, then acquires the consistence of butter, and by exposure to the air becomes harder and changes to a reddish hue. As met with in commerce it is of two kinds—that which is called *myrrh in tears* and

that called *myrrh in sorts*. The smell is peculiar and rather disagreeable; the taste is bitter and very unpleasant.

The alcoholic tincture of the best myrrh, mixed with equal parts of nitric acid, becomes red or violet. The tincture of the false myrrh (of Bonastre) so treated becomes turbid and yellow, but not red. The taste of this false myrrh is very bitter, but the smell is that of turpentine.

Myrrh, though containing a volatile oil, seems to act more from its bitter qualities, which approach to the character of a stimulant tonic. It increases the energy of the whole frame, giving solidity to the solids and greater consistency to the fluids. The secretions of the mucous membranes particularly are improved by it, and diminished in quantity when excessive. Its introduction into the stomach is

followed by a sense of warmth, which diffuses itself over the whole abdomen. The appetite is increased and the digestive process is much facilitated, especially where there is weakness and torpidity of the intestinal canal, sometimes accompanied by too copious mucous secretion (constituting what is termed *diarrhæa mucosa*). In affections of the lungs, bronchitis, chronic cough, and hysteria, myrrh is found to be a valuable remedy; and, from its cleansing power in the case of external ulcers, it has been recommended in consumption. In amenorrhœa occurring in feeble persons it is of great use, along with aëtic medicines and preparations of iron.

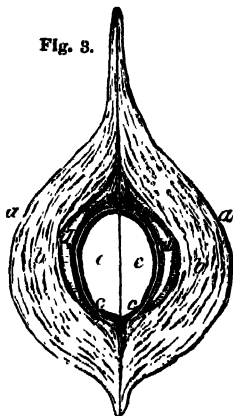
The produce of the *Balsamodendron Gileadense*, though called a balsam and denominated Balsam of Mecca and Balsam of Gilead, is not entitled chemically to rank as such, being an oleo-resin.

It is of two kinds, that obtained by spontaneous exudation, and that which is obtained by boiling the branches. The former is so highly prized in the East, and so expensive, that it is never brought to Europe. That which is obtained by boiling is of different qualities and value, according as the boiling is continued for a short or long time. When for a short time only, the substance which floats on the surface is highly esteemed, and almost all of this quality is consumed in Asiatic Turkey and Egypt. The variety procured by long-continued boiling is sent to Europe in small conical leaden bottles, the mouth of which is closed with a leaden stopper and covered over with bladder. It is, however, frequently adulterated on account of its high price.

**MYRSINÆÆ** are chiefly subtropical plants belonging to the *GAMOPETALÆÆ*, and so nearly the same in their fructification as the primulaceous species of northern climates that scarcely any valid mark of distinction can be found between them. The general appearance of the two orders is, however, widely different; *PRIMULACEÆ* consisting of herbs with no development of woody matter, whereas *Myrsinææ* are trees or shrubs, and besides have an indehiscent fruit.

**MYRTACEÆ** form a very extensive and important order of plants, exclusively inhabiting warm countries, and in all cases either shrubs or trees; an herbaceous form of the order is unknown. The most northern station of the species is the south of Europe, where the Common MYRTLE (*Myrtus communis*) grows wild. Among the table-fruits of the tropics are the GUAVA, yielded by different species of *Psidium*; the rose apple and jamrosade, produced by *Eugenia malaccensis* and *Jambos*; of spices, CLOVES are the flower-buds of *Eugenia caryophyllata*; and allspice consists of the dried berries of *Pimenta officinalis*. The species with capsular fruit are principally found in Aus-

Fig. 3.





tralia, where, in the form of *Eucalyptus* and *Leptospermum*, they constitute one of the most striking features of the vegetation. See *EUGENIA*, *EUCALYPTUS*.

Myrtaceæ belong to the *POLYKKTALÆ* (cohort *Myrtales*). The chief characteristics of the order are that the flowers are regular and hermaphrodite; the calyx-tube is adnate to the ovary at the base, or even to the insertion of the stamens; there are four or five petals inserted at the margin of the disc, and sometimes combined into a hood, which falls during flowering; the disc clothes the inside of the calyx-tube; there are numerous stamens; the ovary is syncarpous, generally inferior; it has two or several cells, with placentas affixed to the axis, or more rarely it is one-celled, with a placenta near the base; the style is simple, with terminal stigma; there are two or several ovules on each placenta; the seeds are without perisperm. There are 1800 species, chiefly natives of the tropics, but a few are found in the temperate parts of the northern hemisphere and in Africa beyond the tropics. The Plate *MYRTACEÆ* illustrates the above characteristics, and at the same time gives illustrations of important plants. Fig. 1 represents *Metaleuca minor*, from the leaves of which *CAJUPUT OIL* is distilled; fig. 1a is a transverse section of the three-celled ovary, inclosed by the calyx-tube; and fig. 1b is a longitudinal section of the flower with the five parcels of stamens cut off. Fig. 2 is a flowering branch of *Pimenta officinalis* (or *Eugenia Pimenta*)—the dried berries (fig. 2b) form the well-known allspice; fig. 2a is a transverse section of the ovary, and fig. 2c is a longitudinal section of the flower. Fig. 3 is *Eugenia caryophyllata*—the dried flower-buds (fig. 3a) are *CLOVES*; fig. 3b is a transverse section of the ovary; fig. 3c is a longitudinal section of the flower, after the fall of the petals. Fig. 4 is a branch of the Australian Gum-tree (*Eucalyptus Globulus*), and fig. 4a is a transverse section of the ovary.

**MYRTLE** (*Myrtus communis*) is a bush with evergreen opposite leaves, which, when seen by transmitted light, appear as if pierced with small holes, in consequence of their containing a great number of little reservoirs of a transparent aromatic oil; the flowers are white and have a very agreeable scent.

The myrtle is apparently wild along the south coast of France, and in Sicily it occupies large tracts of country; but it does not appear to be really a European plant, but a native of Persia. In this country the myrtle is seldom able to bear the winter, except when planted in front of a south wall and protected from severe weather. In the Isle of Wight, some places along the south coast of England, and in many of the mild parts of Ireland, however, it becomes an ornamental bush, without requiring any protection. The myrtle was considered by the ancients as sacred to Venus, and wreaths of it were worn by the magistrates in Athens and victors in the Olympian games. The Tuscans prepared a wine, *Myrtidanum*, from it, and it was also used in medicine and cookery. At the present day it is used in perfumery, and the wood by turners.

**MYSIA** (Gr. *Musia*), an ancient division of Asia Minor, forming the north-west extremity of that peninsula, and bounded on the N. by the Propontis, on the W. by the Hellespont and the Ægean Sea, on the S. by Lydia, from which it was divided by the mountains which separate the valley of the Caicus from that of the Hermus, and on the E. by the river Rhyndacus, which divided it from Bithynia. On the south-east the high land forming the interior of Mysia joins the central table-land of Phrygia towards the town of Azani. The Æolians occupied the maritime coast, from the Hermus to the *Æsopus*, and built their cities there.

Mysia became subject to the Lydian monarchy, after the fall of which it formed part of one of the satrapies of the Persian Empire, which included also Lydia. It was afterwards in succession under the Macedonians, the kings of Pergamus, and the Romans. Under the Romans it formed

part of the province called Asia. The principal towns were Pergamus, Cyzicus, on an island now a peninsula, Abydos, Lampsaenus, and Adramyttium.

**MYSORE** (or *Maisir*: *Maresh-asura*, "Buffalo-monster"), a native state in Southern India, lying between 11° 40' and 15° 0' N. lat., and between 74° 40' and 78° 30' E. lon., surrounded on all sides by British territory. The administrative headquarters are at BANGALORE, though Mysore Town was the residence of the late maharajah. The area of the state is 27,078 square miles, and the population 5,000,000.

Mysore is naturally divided into two regions of distinct character—the hill country, called the Malnad, on the west, confined to the tracts bordering or resting on the Western Ghats; and the more open country, known as the Maidan, comprising the greater part of the state, where the wide-spreading valleys and plains are covered with numerous villages and populous towns. The Malnad is a picturesque land of hill and forest, presenting most diversified and beautiful scenery. With regard to the Maidan or open country, the means of water supply and the prevailing cultivation give the character to its various parts. The level plains of alluvial black soil, in the north, grow cotton or millets; the districts in the south and west, irrigated by channels drawn from rivers, are covered with plantations of sugar-cane and fields of rice; those irrigated from tanks are studded with gardens of cocoa-nut and areca palms; the high-lying tracts of red soil, in the east, yield *ragi* and similar dry crops; the stony pasture-grounds, in the central portions of the country, are covered with coarse grass, and occasionally relieved by shady groves.

The principal forests are found clothing the sides of the western mountains; they abound in teak, blackwood, and other valuable kinds of timber. There are good roads throughout the province, and branches of the Madras Railway to Bangalore and Mysore are now in course of completion.

The climate of Mysore is sensibly affected by its considerable elevation above the sea. It is temperate, but not so healthy as might be expected, owing to the prevalence of fever in many localities. The year may be divided into three seasons, the hot, the rainy, and the cold. In the hot season the thermometer ranges from 69° to 90° in the shade, and in the cold season from 50° to 77°. The nights are seldom hot; the mornings and evenings are always cool if not cold, and the air is very elastic. The cold season is generally free from rain, and lasts till the end of February. The rain in April and May is generally very heavy, often filling the tanks in a few hours. The province is favoured by two monsoons, the south-west and the north-east, the former commencing at the beginning of June and closing about the end of August. The north-east monsoon sets in at the beginning of October, and generally ceases about the middle of November. The rain is more continuous than heavy throughout the greater part of the country, but in the tracts verging upon the Western Ghats it is unintermitting and puts a stop to all traffic. The annual rainfall of these regions is nearly five times that of the rest of the country, the quantity diminishing rapidly as the distance from the Ghats increases. The close of the rainy season in November is marked by dense fogs, which prevail all over the country during December and January. Electric storms are common and excessively violent.

The crops chiefly grown in Mysore are rice, *ragi*, millets, gram, wheat, sugar-cane, oil-seeds, cotton, opium, betel, cocoa-nut, and tobacco. Coffee is extensively cultivated, and the cultivation of this berry now takes rank as one of the most important industries of the country. Lac, gums, pepper, and resin are also produced, and sandal-wood grows spontaneously throughout the province. Many of the fruits and vegetables of Europe are also successfully cultivated. The trade of the country being difficult to develop,

owing to its land-locked position, the mountain barriers which separate it from the surrounding countries on three sides, and the want of navigable rivers, the manufactures are on a small scale and mostly carried on to supply native consumption. Gold dust is found in several places, and during recent years quartz mining has been carried on by numerous British companies. Iron is found, and kankar, a calcareous concrete used for road-making, exists in considerable quantities between Bangalore and Seringapatam. Garnets also are frequently met with, while common salt and carbonate of soda impregnate the soil in many places.

**History.**—It was to the Mussulman usurper, Hyder Ali, that Mysore owed both its widest extension and the organized empire which tolerated no subjects but slaves. The usurpation of Hyder Ali is generally dated from 1761. It is a matter of imperial history how, after the death of Tippoo in 1799, the Marquis of Wellesley resolved to restore the Hindu dynasty in the person of a boy four years old; and how, in 1831, the British assumed the direct administration of the state in consequence of the misgovernment of the then ruling prince. It was restored to the government of the rajah, under the usual conditions to be observed by native princes in India, in 1881. In 1811 Bangalore was fixed upon as the most healthy station for the European troops, and as the headquarters of the civil government, though Mysore still continues to be the residence of the rajah.

**MYSONE**, the ancient capital of the state and administrative headquarters of the district, is situated 10 miles south by west of Seringapatam. The population is about 60,000. The town lies at the foot of the Chamundi Hills, in a valley formed by two parallel ridges, running north and south. The streets generally are broad and regular, except in the fort. The majority of the houses are tiled, and some of them are substantial buildings, two or three storeys high, with terraces. Altogether, the town has a clean and prosperous look, and of late years the efforts of the municipal committee have greatly improved the sanitation.

The fort stands in the south of the town, forming a quarter by itself. The ground-plan is quadrangular, each of the sides being about 450 yards long. The defences consist of a stone wall, ditch, and glacis, with outworks and flanking towers, but they are mean and ill-planned. In the interior is the palace of the maharajah, built since 1800, in an extravagant style of Hindu architecture, and adorned inside with a few paintings executed by a European artist. The front, tawdrily painted and supported by four wooden pillars fantastically carved, comprises the Sejjie or Dashara Hall, where the late maharajah used to show himself to the people on great occasions seated on his throne. This throne is the principal object of interest in the palace. It is made of fig-wood, overlaid with ivory, and is generally stated to have been presented to Chikka Deva Raj in 1699 by the Emperor Aurungzebe. The ivory has recently been covered with gold and silver plating, wrought with the customary figures of Hindu mythology. To be seated on this throne constitutes the coronation ceremony in Mysore; and the state appellation of the maharajah is *Sinhasan-adhipati*, or "ruler enthroned."

Opposite the western gate of the fort is a lofty and handsome building known as the Mohan Mahal, which was erected by the late maharajah for the entertainment of the European officers. The houses of the European residents are for the most part to the east of the town.

**MYSTERIES.** Prominent among the great religious phenomena of the ancient Greeks are certain festivals about the nature whereof it was forbidden to speak, and these were called *mysteria*. The greatest of them were the **ELEUSINIAN MYSTERIES**, elsewhere described; and these are always spoken of with great reverence by the best and most enlightened of the ancient philosophers, even those

who are freest in denouncing the impurities and absurdities of the ancient mythology. The descriptions of the mysteries by the Christian writers are evidently false and malicious. The only excuse that can be made for them is that they may have confused the **ORIC MYSERIES**, and some other such degraded rituals, with the lofty Eleusinian ceremonies. We know that the latter held to Greek minds the position that the Lord's Supper does to the Christian churches. The *mystai* were prepared by prayer, sinlessness for the time, silence, and the recitation of the holy drama for the communication of the sacred food and drink, relics and memorials of the great sorrow of Demeter. We know, too, that relics were lifted from the reliquary by the *mystai*, and reverently placed back, and that they were simple things, probably garments, much as the relics of the Roman Catholic Church are to-day. Strict silence was observed, and the frequent proverb "Silent as a mystery," shows how universal the fact had become. Great philosophers admit that the mysteries "made men live better lives hereafter," and this has often been held to mean that the doctrine of the immortality of the soul was known and taught. We have reason to think that the real divine truths underlying the polytheism of the general religion, the unity of the divine element in all its various aspects, and the brotherhood of man, were taught by these mysteries, and we know also that a splendid dramatic representation of the sacred history of Demeter was enacted, much as our great **MYSTERY PLAYS** of the middle ages (only with far greater reverence) and with the same object—namely, to impress the people with the outward circumstances of religious tradition. Every Greek, and even every stranger properly introduced, might participate, which makes the reverent unbroken silence most perplexing. Perhaps the fact that it was universally taught and believed that all the good gained by participating in the mysteries would be destroyed by chatter about them, operated to close the people's mouth more than the solemn oath every one had to take not to divulge what he saw or heard.

**MYSTERY PLAYS** were a species of dramatic composition devoted to pious purposes, and introducing characters and events from sacred history; differing therefore from the **MIRACLE PLAYS**, which recounted some special miracle, more often not to be found in the Scriptures, but belonging to the legendary fame of the saint in whose honour the church was built. Both kinds of plays were church plays, written by monks and priests, and acted by them on festivals in the sacred edifice, or on a scaffold outside the great doors if the popularity of the play drew too great a crowd for the church to contain. These plays arose from the anxiety of the good fathers to war against the lewd stage of the later Roman Empire. St. Gregory the Nazianzene, in the fourth century, when patriarch (i.e. pope) of Constantinople, attacked the Greek stage by acting better plays of his own, drawn from Bible stories. Instead of the choral dances of the Greek stage, hymns were sung from the collections of the church. Gregory had great success, and his attempt became an organized system throughout the dark ages, lasting until the dawn of the modern drama in the Renaissance. According to a Harleian MS. these shows were thought to contribute so largely to the edification of the people, that one of the popes granted a pardon of 1000 days to every person who resorted peaceably to the plays, performed in the Whitsun week at Chester, beginning with the "Creation" and ending with the "General Judgment." On this point Warton observes that, to those who are accustomed to contemplate the great picture of human follies which the unpolished ages of Europe hold up to our view, it will not appear surprising that the people who were forbidden to read the events of the sacred history in the Bible, in which they are faithfully and beautifully related, should at the same time be permitted to see them represented on the stage disgraced

with the grossest improprieties, corrupted with inventions and additions of the most ridiculous kind, sullied with impurities, and expressed in the language and gesticulations of the lowest farce. Yet they were undoubtedly of service, in softening the manners of the people, making them acquainted through the eye with what they were too ignorant to understand through the ear alone, creating a taste for art, and lessening the popularity of mere exhibitions of physical strength and bodily valour.

*Mysteries* are not to be confounded with *Moralities*, *Farces*, and *Sotties*. *Moralities* were dialogues in which the interlocutors represented feigned or allegorical personages. *Farces* were more nearly what their title indicates, and generally vulgar, gross, and reprehensible in word and action. The *Sotties* were more farcical than farce itself, and often ventured on all the license of pasquinades. By the middle of the thirteenth century lay actors were admitted to take part in the performances of the *Mysteries*, and in the fourteenth century the plays had very greatly passed into the hands of the trade guilds, who vied with each other in preparing complete sets of plays, taking many days to act, and extending from the "Creation" to the "Day of Judgment." Each guild would mount a play of the set at its own cost. Thus at Chester, one of the finest sets we have, the tanners played the "Fall of Lucifer," the drapers the "Death of Abel," the water-carriers "Noah and the Flood."

Traces of these plays occur as far back even as the second century—the incidents taken from the Bible, the form from the classic dramatists. And not only the tragedians, as with the plays of St. Gregory the Nazianzen already mentioned, but the comedians also were imitated. The plays of Hroswitha, a Benedictine nun of Gandersheim, of the tenth century, are all modelled distinctly on Terence. And it really seems, upon examination, that while the *Morality* passed through Chronicle History (with chosen historical types instead of imaginative) into tragedy, comedy arose from the unlikely source of the Bible *Mystery Play*, by way of the *Interlude*. The reason of this grew out of the public nature of the *Mystery Plays* when once they got into the hands of the people. Urban I. in 1264 instituted the festival of the Corpus Christi, in which a large lay element prevailed, and Corpus Christi was the great occasion for performance of *Mysteries*. Chester, almost alone, adhered to the older Whitsuntide.

Not only several sets of plays, but all the details of preparation are still extant; and that they are amusing enough the subjoined extracts may show. The players were paid partly after the work they had to do, partly after their dignity. Thus in a play on the crucifixion at Coventry, the important characters (Herod and Caiaphas) received *iijs. iiijd.* each, but those who had less to do were ranked more punctiliously thus:—"Imprinis paid to God *ijs. viiij.*; itm to Pilate-his-wyf *ijs.*; itm to the Devil and Judas *is. viij.*, to Peter *xviij.*, to Fauston for hanging Judas *vd.*; itm to the same for coceroyng *iiij.*." The verb "to cockeroyn" (coceroyn) is quite new to modern dictionaries. The clergy at first lent their robes, but towards the close of the fourteenth century this was denounced as sacrilege, and the guilds were at much expense for the dressing of their pageants. The Coventry accounts therefore contain items such as these:—"To reward Mrs. Grinsby for lending of her gear for Pilate's wife, *xliij.* Paid for a pair of gloves for God and dyvers necessities for the trimmyng of the Father of Heaven," &c. The actor playing God always wore gloves, and his face was gilt all over. And stage effects, too, were costly:—"Paid for mending of bell, *ij.*; itm for painting of hellmouthe, *iiij.*; itm for keeping fyre at hell's mouthe, *iiij.*; itm for setting the world of fyre, *vd.*," &c.

Four principal sets of *Mystery Plays* are now easily accessible, besides single specimens. These are the Chester, Coventry, Wakefield (called the Towneley, from the pos-

sessors of the MS.), and York plays. The Chester set is the oldest, and contains twenty-five plays. It was carefully edited by Thomas Wright for the Shakspeare Society, in two vols. (1813 and 1817), and is known to be at least as early as 1250, since it was performed, as the prologue sets forth, under the mayoralty of Sir John Arnway. The MS. itself is of date 1600, and from its blunders in spelling, &c., is evidently a copy of a late fourteenth century MS. The Coventry series, belonging to the Gray Friars there, has forty-two plays, and was brought out for the Shakspeare Society in 1841 by Mr. Halliwell Phillips; the date of the MS. (Cotton MSS., British Museum) is 1468. The Wakefield collection belonged till very lately to the Towneley family, and is now the property of Mr. Quaritch. It is written on fine vellum, by the monks of Woodkirk, and possibly was at first acted by them. Eventually it passed into the hands of the Wakefield guilds. It is in old Yorkshire dialect, full of Scandinavianisms, and is coeval with the Coventry series. Dr. Lingard edited it for the Surtees Society in 1836. The York series of forty-eight plays purports to be a copy of the set as being acted in 1415, set down to prevent variation. The MS. is about a quarter of a century later, and may be a copy. It is probable that the York plays are next oldest to the Chester, and that they were written between 1340 and 1350; five of the Wakefield plays are almost transcripts of the York. The York plays, which the Ashburnham family had kept for years jealously hidden away, were at length allowed to be published in 1855, under the care of Miss Toulmin Smith, by the University of Oxford (Clarendon Press). The edition is extremely fine and scholarly. The York plays were last acted in 1579.

In plays such as these, produced, if not written, for a very ignorant crowd gathered in the streets and bent on merriment, it was absolutely necessary that fun should be introduced if they were to be successful in winning the ear of their audience; and thus, while the courtly Masques and *Moralities* passed into tragedy, the *Mysteries* became ever more and more humorous. In the Wakefield plays Cain brawls and bullies his hind in true Yorkshire fashion, and Noah's wife (as also in the Chester series) is a mirth-provoking terragant, making broad fun with the domestic troubles of the afflicted patriarch. Pilate (in the shepherd's play) makes a good point over buying a field from a squire for thirty pieces of silver, and securing the deeds without paying the money; and the shepherds, waiting for the advent, are right comical fellows, who drink Alton ale to warm themselves in the bitter cold.

The long performance began at six in the morning, or even before, and the spectator would then see the waggon with the "Creation" pageant draw up before him and begin its representation. That done, the "Death of Abel" would follow on another wheeled platform, while the "Creation" jolted onwards to repeat its story in another place. Abel murdered and carried forward, "Noah and the Flood" would follow, and so on right away to the "Last Judgment." Christ was actually borne through the streets to the judgment seat of Pilate; the prodigal son went away out of sight into the fields and afterwards returned from thence. Everything was made as real as possible. The acting continued usually for three whole days. These things were still in progress at Coventry in 1580, when Shakspeare was sixteen years old.

Such was the rage for these curious exhibitions, says the elder D'Issraeli, that René d'Anjou, king of Naples and Sicily, was accustomed to order their representation on a most magnificent scale, and to make them a serious concern. Being in Provence, and having received letters from his son, the Prince of Calabria, who required immediate reinforcements, he replied that "he had a very different matter in hand, for he was fully employed in settling the order of a *Mystery in honour of God*."

As said above, in the fourth century a Greek tragedy on the Passion of our Saviour was written by St. Gregory the Nazianzene. A Mystery on the same subject is still celebrated every tenth year by the peasants of Ober-Ammergau, a Bavarian village, in fulfilment of a vow made during a pestilence in 1633. The representation which took place in 1880 was attended by thousands of spectators. (See "The Ammergau Passion Play," by the Rev. M. Maccoll.)

**MYSTICISM** is the name given to a certain phase of thought and feeling which has manifested itself in connection with all the great religious systems of the world, and though from its very nature it is incapable of receiving any exact definition, it represents, on its speculative side, an effort of the human mind to grasp the reality of the divine nature, or the all-pervading spirit of the Highest, while in its practical aspect it deals with the methods whereby the spirit of man can best attain to communion with God and become a partaker in his nature.

As in ordinary life we see that, while the majority of men gather their knowledge mostly from without, from observation, experience, and reason, there are a few whose best thoughts seem to come from within, and who are the slaves of their own intuitions or ideas; so in religion, together with its martyrs, missionaries, workers, and theologians, there are always a few who are apparently moved by an impulse from within to seek direct communion with the spirit of God, and who are chiefly moved in the direction of contemplation and the exercise of the passive virtues of the soul.

To men of strong energetic natures religion comes as a call to conflict, and they yield to it their highest obedience when they surrender everything in order to do battle with evil, ignorance, and oppression. Others of more thoughtful and less energetic character, under the same impulse, are moved to seek after truth, to search out the thoughts of the divine mind as expressed in the universe, and such men become teachers, moralists, and theologians. But there have at all times been a few of the mystics to whom religion has come as a divine vision, and who have been led in consequence to exalt meditation to a high place in their system, as being the best means of attaining to a knowledge of God.

Historically we find that the great religious systems of the East, Brahmanism and Buddhism, are pervaded throughout by mysticism. Their devotees have reached the furthest limits of human endurance in their efforts to obtain by asceticism the subjugation of the body and the exaltation of the spirit, and regarding the separate existence of the latter as an evil, they seek to obtain as their highest good the extinction of personal existence and the absorption of the soul into the deity.

Mysticism was foreign to the spirit of ancient Judaism, with its monotheistic belief, elaborate ritual, and strong national feeling; but in the later stages of the history of the Jews it found a place in the ideas of those who, like Philo, came under the influence of Greek philosophy, and it may possibly have formed part of the system of the Essenes.

In Mohammedanism there was very little opening for mysticism during its earlier years, but in the histories of the Arabs there is reference to a woman named Rabi'a, who lived in the first century of the Hegira, and who was buried at Jerusalem, who taught certain theories of an essentially mystic nature. In the rise of Sufism, however, more than a century later, the old pantheism of the Persians reappears, wearing an outward conformity to the doctrines of Islam, but being essentially of a different spirit. The term Sufism is derived from the woollen garment (*Sûf*) worn by the followers of Abu Said, who flourished somewhere about the year 200 of the Hegira. This phase of religious feeling has been rendered famous by the poetry of its votaries, Hafiz and Saadi, and it has continued to exist in Persia down to the present day.

Mysticism formed an important element in the system of

NEO-PLATONISM, from which it passed into Christianity. Speculations of a mystical character may be found in the writings of several of the fathers, and in the systems of some of the divergent or heretical sects of the early days of the church; but the first example of mystical doctrine in a complete form is found in the "Theologia Mystica" of the pseudo-Dionysius the Areopagite. [See DIONYSIUS.] The doctrines systematized by the pseudo-Dionysius were advocated and defended by Maximus the Confessor (580-622), who wrote some commentaries on the "Theologia," and it was from these sources that ERIGENA, who may be regarded as the founder both of scholasticism and mediæval mysticism, derived the chief doctrines of his own system. The next name of importance in the history of Christian mysticism is that of Bernard of Clairvaux (1091-1153), and during the twelfth and thirteenth centuries it finds its chief exponents in the Victorines or the followers of Hugo of St. Victor, near Paris. The end of the twelfth century was marked by the rise of the societies of the Beghards and Beguines in the Low Countries and on the Rhine, which, though at the outset in harmony with the church, were yet of an essentially mystic character. The Brethren of the Free Spirit, a sect which arose during the thirteenth century, were heretical in their doctrines, and they sought to substitute a kind of mystical pantheism for the teaching of the church. They also advocated the most complete antinomianism and fell into practices of gross immorality, as did also the Beghards during the latter period of their history.

The notion that the actions of the body are indifferent so long as the soul is at one with God has often been associated with mysticism, and where this has been taught the most revolting immoralities in practice have but too surely followed as a natural consequence. The more celebrated mystics of the fourteenth century, however, such as Eckhart, Suso, Tauler, Ruysbroeck, Groot, Thomas à Kempis, and Jacob Boehme, are free from this taint, and their writings not only served to promote piety in the church, but also to prepare the way for the more searching purification of the Reformation. On the other hand the wild doctrines of Munzer and the Zwickau prophets served to bring about the celebrated Peasants' War, and the excesses of the Anabaptists in Münster have already been noticed under ANABAPTISTS. Since the Reformation mysticism in the Roman Catholic Church is associated chiefly with the names of St. Theresa (1515-82), François de Sales (1567-1622), Miguel de Molinos (1627-96), and Madame Guyon (1648-1717). Among the Protestants there were regular societies formed of the students and followers of Jacob Boehme at the time of the Commonwealth, and George Fox, the founder of the Quakers, was essentially a mystic in his teaching as to the influence of the spirit and doctrine of the "inner light." Emmanuel Swedenborg is generally regarded as the most prominent of the more modern mystics, and he has been selected by Emerson in his "Representative Men" as a type of this class; but, as Emerson himself points out, he lacks the fervent impulse towards God and the warm sense of love towards man by which most of the mystics have been characterized, and "his revelations destroy their credit by running into detail." The mysticism of the celebrated William Law was free from the delusive visions of Swedenborg, and its elevation and spirituality have been proved by the influence it exerted over leaders of the great English revival of the eighteenth century.

**MYTHOLOGY** (Gr. *muthologia*). The mythology of a people may be said to consist of those legends and traditions which have been, at some period or other, usually believed by the majority of the nation, but which cannot, on principles of sound criticism, be regarded as historical truths. The term therefore is not confined to the religious systems of the pagan nations; it includes everything that

has been an object of popular belief, not merely respecting the origin, attributes, and adventures of the gods, but also concerning the early heroes, migrations, and exploits of a people. The historical inquirer has frequently great difficulty in determining at what time the mythology of a nation may be said to cease and its history to begin; and in fact it is impossible to determine the exact time, since the transition from mythology to history must be gradual; and many traditions, which appear at first sight entirely mythological, may, upon further examination, be proved to contain some great historical truths. The scepticism which calls upon us to reject as mythological everything in the early history of a people which appears to us extraordinary and unaccountable, is as little worthy of respect as the credulity which requires us to believe everything that has been recorded respecting the exploits and adventures of the early heroes of antiquity.

Though a mythological event may be fictitious, it appears that mythology differs from fiction or fable, in having been once generally believed by a people as an account of events which actually took place.

The discovery of Sanskrit has not only rendered possible a science of comparative philology, but supplied a key to those myths of the Greeks which had previously baffled the most penetrating criticism. It is now evident that the mythology of all the Aryan nations proceeded from a common origin. There exists an indisputable likeness between the legends of the Norsemen and the fables of the Greeks. In both cases they were anciently founded upon the ordinary speech of the people before the dispersion of the race. Their language personified or apostrophized every natural object, and when its original meaning in the lapse of time had become greatly obscured, its personifications were adopted as realities, and connected with an order of personal and anthropomorphic gods.

A myth, according to the theory of Professor Max Müller, means a word, but a word which, from being a name or an attribute, has been allowed to assume a more substantial existence. Most of the Greek, the Roman, the Indian, and other heathen gods, are simply poetical names, which gradually invested themselves with a divine personality never intended by their inventors. *Eos* was a name of the dawn before she became a goddess, the wife of *Tithonos*, or the dying day. *Fatum*, or fate, meant originally what had been spoken; and before Fate became a power even greater than Jupiter, it meant that which had once been spoken by Jupiter and could never be changed, not even by Jupiter himself. *Zeus* originally meant the bright heaven, in Sanskrit *Dyaus*; and many of the stories told of him as the supreme god had a meaning only as told originally of the bright heaven, whose rays, like golden rain, descend on the lap of the earth, the *Danaë* of old, kept by her father in the dark prison of winter. No one doubts that *Luna* was simply a name of the moon; but so likewise was *Lucina*, both derived from *lucere*, to shine. *Hekaté*, too, was an old name of the moon, the feminine of *Hekatos* and *Hekátēbolos*, the far-darting sun; and *Purra*, the Eve of the Greeks, was nothing but a name of the red earth, and in particular of Thessaly. Thus, too, the cruel myth of *Niobé* and her children, slain by the pitiless arrows of Apollo and his sister, resolves itself into the melting away into tears of the winter's snow, under the rays of the bright sun, for *niobé* is but a variant of the root *niv* (the Latin *nix*, *nivis*, snow). And the pursuit of *Daphné* by Apollo is but the dawn flying before the sun, for the word still remains to us. This is the great philological theory, and very subtle and far-reaching it is in its penetration of the mystery of mythology.

In this article classical mythology is alone treated of, but it may stand as a type for all mythologies, for all that are known have much the same curious interblending of poetical and beautiful fancies with revolting, cruel,

sensual, and degrading tales told of the great gods themselves. Such myths as those of Europa, of Leda, &c., where maidens are deceived by the highest of the gods assuming the form of a brute, or much of the Bacchus and of the Venus myths, are most bewildering to the student. They were not less puzzling to the ancients themselves. Plato complains terribly of the poets for speaking of things that "ought never to have been spoken about," and Hérakleitos, in 460 B.C., publicly declared that for his tales about the gods Homer deserved to have been driven from the public assemblies and flogged. Xenophanes also, a little before, had bitterly said that "Homer and Hesiod ascribed to the gods whatever is scandalous among men; yea, they declared that the gods had committed nearly all unlawful acts, such as theft, adultery, and fraud." Aristotle boldly declares that the principles of the divine government have been handed down in the form of myths. "The rest," he says, "has been added mythically in order to persuade the many." The philosophers themselves taught the unity of God, and the great mysteries inculcated a lofty morality: only the popular religion dealt with these horrible and disgusting things. Why should we be told how Tantalos killed his own son, boiled him, and gave him to the gods to eat? or that the gods discovered the trick and threw the limbs into a caldron, restoring Pelops to life, all but one shoulder, eaten by Démêtér, which had to be replaced by ivory? What divine truth is there in this?

We have seen the philological explanation. There is another, due to the ancient Euhemerus, and of which the latest variation is the nature-myth theory, of which Sir George W. Cox is the leading exponent. This theory started under Euhemerus by assuming a positive historical fact as the basis for every myth. A young woman called Aurora was pursued by a young man with red hair. She hid herself behind a laurel bush (Gr. *daphnē*), and so you have the legend. This theory, manifestly absurd, has been abandoned in favour of the myths being a mystic interpretation of actual natural occurrences. The twelve labours of Hercules are referred to the twelve signs of the zodiac; the gods, and even the heroes, are variations in one vast solar mythology. The difficulty of turning everything into sun and cloud, dawn and twilight, is that one set of phenomena has to furnish forth such a multiplicity of various legends.

No doubt much of what Professor Max Müller and Sir George W. Cox assert is actually true. Every one must agree that *Daphnē* is the dawn and *Niobé* the snow, even were their names not there to prove the case; but why did *Daphnē* turn into a laurel? Everyone sees that *Kronion*, "ancient of days," an epithet of Zeus, happening to be identical in form with an adjectival word, "son of Kronos" (had there been such a progenitor), caused the Greeks to invent a purely fictitious father Kronos for Zeus, when they had forgotten what *Kronion* really meant. *Kronion* the ancient was thought to be Kronos, son of Kronos, and a Kronos was therefore invented. This we can see, and can understand why the Kronos legend is so awkwardly thrust in as it is; but what remains inexplicable is the horrible tales about Kronos which the Greeks invented when they had created their god out of nothing. No sun or dawn phenomena could suggest horrors of this kind to an artistic and poetical people. Besides, in many cases there is reason to think the myths are older than the names.

To meet this centuries-old puzzle Mr. Andrew Lang has boldly asserted that all that is base in mythology, wherever it is found, is simply a survival of barbarous usages. Savages now believe in fetiches, in totemism, in metamorphoses. Do not the cultured Chinese believe in transmigration of souls, and are not the Oriental stories full of men turning into beasts even to this day? Kronos mutilated his father and swallowed his own children to secure the sovereignty of heaven, but instead of Zeus the youngest, a stone wrapped in swaddling clothes was given

him. Zeus grew up, gave his father a drugged draught, and Kronos brought up all the children, stone and all, the children being alive and joining Zeus in ruling heaven thereafter. Could anything more senseless be devised? Yet we find, first, a Maori myth in New Zealand of the heaven and earth pressing so close together that their children were swallowed up and stifled between them, until one of the children cut the cords which bound the parents together, and so attained to light and air. This is but another way of expressing the statement of the waters being kept asunder, and space for growth gained, by means of a solid firmament, as we find it narrated in Genesis. Chaos must be thrust apart and the earth is *Midgard* (in the Norse mythology), the *yard* or place in the *midst* of the universe. Also the Bushmen have to-day plenty of legends of swallowing and disgorging alive, and the Zulus and the Indians of Guiana have more, so no doubt had the Greeks; but what was quite natural and easy of belief when they were savages became horrible as they advanced in culture. Yet being conservative to the last degree, they dared not touch the old legends, even while they abhorred them. As for the stone of Zeus which was there visible "unto this day," every savage tribe has some similar fetish to show. Probably it was a meteorite, or a volcanic stone "fallen from heaven," and needing a tale therefore to account for it. Such a stone was the famous Palladium (or image of Pallas) of Troy, and later of Rome, held so sacred that the very freedom of the city depended on its preservation. Briefly, Mr. Lang's plan is to look among savage nations for a similar practice, whenever one of the numerous mythological puzzles is to be solved, and to trace it out in this manner as a perfectly natural result of savage customs ("Custom and Myth," London, 1886). As for the smaller tales of fanciful and graceful beauty we can see the course of their invention by listening to our own children when they are in an imaginative mood. "Do you know why the robin has a red breast? That is where he pecked himself to feed his young in the hard winter, and so stained his feathers." This, and other fancies, they will either concoct or receive with the gravest belief in their probability. Their dolls talk, and so do their dogs and their birds. So it was in the childhood of the world; and such pretty fancies, crystallized by the sanctions of religion, form a very large part of the classical mythology.

Some attempt at a brief account of such parts as are connected in this complicated web may now be given. A similar general account of the NORSE MYTHOLOGY will be found under that heading.

The origin of the world, as told by Hesiod, represents all as a chaos, out of which Eros, god of love, first emerged. Gradually the sea, the earth, and the sky, daylight and darkness, took form; and Ouranos, the heaven (the *Varuna* of the Sanskrit Vedas), lay close pressed to Gaia, the earth. These primeval gods, who were at the same time beings themselves, and not separate entities ruling over departments of the world and of life, were agitated by Eros and induced to form themselves into pairs. Children were born to Ouranos and Gaia, but were stifled as they were pressed close amid the hollows of the bosom of mother earth. To prevent further increase and to free themselves, Kronos, one of them, mutilated his father with a sickle of adamant, and thrust the heaven and the earth asunder. The form of the world was now held to be a disc, with thickened edges (cliffs) to keep out the great ocean which encircled it, and upon the rim of the ocean rested the broad vault of heaven. (Homer tells the tale otherwise, and makes all arise from father Ocean; and Eros was perhaps more generally held by the poets to be not the oldest of the gods, but the child of Aphroditê.)

The new rulers of the world were called Titans. Necessarily they were, as children of the same parents, all brothers and sisters. Their union, therefore, is only one

degree less repulsive to us in thought than the union of Ouranos with Gaia, who was held to be his mother. But it must be remembered always that these personages are symbols, and that it was not difficult to the minds of our remote ancestors to regard the same gods in succession in varied aspects, now as brother and sister, now as husband and wife, now as parent and child, without that rigorous logical view which would fix either the one relation or the other. We ourselves poetically call the rain the child of the clouds, or the clouds the offspring of the rain begotten of the sunbeams, or rain and clouds alike children of the sky. With savages and with the ancients this mode of speech was a little more firmly crystallized, that is all. It is different when we come to the Olympian deities, for whom the poets make substantial dwellings and heavenly food and raiment, and whom they endow with all the passions and thoughts of men—love, jealousy, hatred, who quarrel and make it up, who fight, plot, and betray, who use men and the world as their puppets, and are themselves controlled by the mysterious Fates.

Returning, however, to the second race of gods, the Titans, we find them paired thus, in a group of twelve principal gods, with some inferior deities added:—Kronos (god of harvest, with the sickle) and Rhea; Okeanos (sea) and Tethys; Hyperion (sun) and Thia; Koios and Phoibê (moon); Iapetos (law) and Themis, Kreios and Mnemosunê (memory). Other children of Ouranos and Gaia were the three Kuklôpes (Lat. *Cyclopes*), monsters with one round eye in the middle of their forehead, whose strength so alarmed Ouranos that he thrust them back into the womb of earth. (This is a figure to account for the fire of volcanoes, where these Kuklôpes are working at metal work and forging the lightning and the thunderbolts underground.) Again, another trio were the hundred-handed giants, Kottos, Gyges, and Briareos or Algaion; and these also Ouranos cast into Tartaros, thereby so enraging Gaia that she furnished Kronos with the sickle which freed him and his brother Titans. From the drops of blood which fell from the maimed heaven rose the trio of Furies (Erinnyes) Alektô, Tisiphonê, and Megaira, who carried out the decrees of the all-directing trio of Fates (Moirai), the children not of Ouranos and Gaia, but of another pair of their fellows among the primeval gods, namely Darkness and Night (Ereboi and Nux). Kronos and the Titans called in the Kuklôpes and the "Hundred-handed" before they could finally master the primeval gods, but the victory once secure the latter were thrust back into Tartaros. To dash his triumph, Kronos was told by his conquered father that he too should fall before his sons. Kronos was resolved to prevent this, and swallowed his children alive as fast as they were born. The sixth child was Zeus, and Rhea his mother managed to conceal him at birth. Instead of the child she gave Kronos a stone wrapped in swaddling clothes. Zeus, grown-up, induced Thetis, daughter of the Titan Okeanos, to give Kronos a potion which caused him to vomit forth the swallowed gods, Hestia, Démêtêr, Hêra, Ploutôn, and Poseidôn. These, under the command of Zeus, occupied Mount Olympus in Thessaly, and thence waged war against the Titans for ten years. The primeval goddess Gaia at last promised the Olympians victory if the assistance of the imprisoned Kuklôpes and their brothers was obtained. The thunder and lightning of the Kuklôpes gave victory to the Olympians; the Titans were hurled into Tartaros, those of them who did not submit, and their three "hundred-handed" brothers were set to keep guard over them.

Many children of the gods of the older dynasty are also called Titans; such are the brothers Atlas, Promêtheus, and Epimêtheus, Hekâtê, Lêtô (Lat. *Latona*), Purrha (Lat. *Pyrrha*, the red, that is, the fruitful soil), Hêlios (sun), Selênê (moon), the two last the children of Hyperion the sun-god.

Zeus and his colleagues had yet another war to wage. Besides the Furies, twenty-four giants (*Gigantes*) had sprung from the drops of the blood of Ouranos which fell into the bosom of mother earth; and these assailed Olympus, so that the *Titanomacheia* was succeeded by a *Gigantomacheia*. Hēraklēs helped the Olympians in this contest, and the enormous dead bodies of the conquered were buried under the islands of the sea. (These islands were frequently volcanic, and their rumblings were set down to the giants stirring in their death-sleep.) Homer and Hesiod know nothing of this second contest. This is what makes classical mythology so thorny a subject; no two poets tell the story in exactly the same way. All one can do, to make a tolerably connected tale, is to select those points on which most writers are fairly in accord.

The new dynasty was soon increased to twelve, the number of the old; and it was far more specialized. Besides Zeus (the Sanskrit *Dyaus*) and his consort Hēra, divinities of the sky and rulers of gods and men, Dēmētēr, goddess of the fruitful earth; Ploutōn (or Haidēs), ruler of the under-world; Poseidōn, ruler of the sea; and Hestia, goddess of the hearth-fire, fire in its domestic aspect, there were six others equal in power (save to Zeus alone). These were Athēna, whose birth Zeus dreaded, as she was the child of Mētis his first wife, daughter of the Titan Okeanos, and Mētis was the wisest of the earlier gods. Zeus therefore swallowed his wife while yet the child was unborn, an apparent improvement on the plan of his father Kronos. But the Fates were not to be balked, and at the appointed time the goddess Athēna sprang in full panoply from his brain, and her chief attribute was wisdom (as well wise conduct in war as in the civil arts and sciences). Two others of the chief gods were children of Zeus by Hēra—Arēs, god of battles, and Hōphaistōs, god of handicrafts, especially of work in metals. Two others were children of Zeus by the Titan-goddess Lētō, and these were Apollōn, ruler of sunlight, and Artemis, ruler of moonlight, both of them guardians of the chase also—the brother the god of prophecy, of poetry, and the liberal arts; the sister the goddess of chastity, as well as possessing many other attributes. Finally Aphroditē, the goddess of beauty and of productive increase, was the child of Zeus by Dionē (Dionē being a daughter of the Titan Okeanos), as Homer says, or springing direct, self-born, from the foam of ocean, as later poets asserted. The Latin names of these twelve great Olympian gods are Jupiter and Juno, Ceres, Pluto, Neptunus, and Vesta; Minerva; Mars and Vulcanus, Apollo and Diana, and Venus. But it is to be noted that these names represented, for the most part, deities of Italic growth, whom when the barbarous Romans learned poetry and the liberal arts from Greece, they forced into the shapes of the Greek gods nearest to them, and endowed them wholesale with the Greek attributes. This point is more fully stated in the separate articles on the Roman gods. It is especially remarkable, for instance, in the violent contrast between Mars (Marspiter, "father Mars") and Arēs. In fact, no one who studies the classical mythology can fail to see that many characters are included in one name—the two gods called Bakchos, the three or four called Artemis, &c., evince a desperate attempt to include the really diverse gods of diverse nations under a few master-types. For the proof of this the reader is referred to the separate articles.

Frequently instead of Ploutōn, whose duties kept him always in the under-world, Hermēs is recognized as the twelfth Olympian deity. He was the son of Zeus by Maia, the eldest and loveliest of the Pleiades, daughters of the Titan Atlas. The Latin equivalent god was made out of the "market-god" Mercurius, rather absurdly. Hermēs was the god of dexterity, cunning, invention, and contrivance; he executed the decrees of the other gods, and

he is never held their equal in power. Counting him as the twelfth of the gods instead of Ploutōn, we see that Zeus ruled one brother, three sisters, and seven children. The only other god of supreme importance was a son of Zeus by the nymph Semele. She, not content with her lover's presence in mortal form, besought him to visit her as he appeared to Hēra. Zeus had sworn to grant her wish, and sorrowfully obeyed. The lightnings which played around him burnt up the hapless girl, but her child was saved by Zeus and carried in his own thigh till birth. This was the god Dionusos or Bakchos (Lat. *Bacchus*), god of wine and of the springing sap in all vegetation, and (from the fact that the drama arose at the Dionysiac festivals) the god of the drama also.

Under Kronos (Lat. *Saturnus*) and the older gods men had enjoyed the *golden age*; under Zeus and the Olympians they came into the *silver age*, equally plentiful and full of enjoyment, but wanting in the former innocence and peace. They even neglected the gods, whereupon Zeus swept them away and they became Daimonēs, spirits. Then followed the quarrelsome *bronze age*, the reign of night, and this wore itself out in mutual strife. Finally the *iron age* supervened, the hard dry time when all men sought to overreach each other by cunning, and no bread was to be had but by toil or cheating. Astraea fled, the goddess of good faith (Greek *Dikē*), deserted such scenes and retired to Olympus, and Zeus sent a great flood to destroy all men. All perished in the deluge save Deukalión and his wife Purrrha, who stayed upon the summit of Parnassos till the waters abated. Then coming down to the soft earth (*Purrrha* means red earth) they cast, by orders of the gods, stones (*lacs*) over their shoulders, and these made nations (*laoi*) of men, who at once set to work to till the ground. But they, our present race, often tempted Zeus by their folly to destroy them also; his vengeance, however, was upon separate men, and the race was never again destroyed.

The lesser deities of the mythology may be held to include the following:—Kōra or Persephōnē, was the daughter of Dēmētēr by Zeus, and consort of Ploutōn in the under-world. The Fates and the Furies have been mentioned. The Seasons (Horai) were daughters of Zeus and the Titan goddess Themis; the Graces (Charites) daughters of Zeus and the Okeanid Eurynomē; the Muses, daughters of Zeus and the Titan goddess Mnemosunē, their names implying their functions. Pan, god of flocks and shepherds, inventor of the shepherd's pipe, with goatfish legs and horn, sensual and noisy in brutish fashion, was the son of Hermēs, whose cunning and inventiveness he inherited in a lower form. His trick wryings often threw country people into a causeless fear, hence called a "panic." Akin to Pan were the Satyrs, also originating from Hermes, forest deities with slight animal characters, such as tiny tail-stumps or pointed ears, the type of their outward form being the exquisite Satyr of Praxitelēs at Rome. The Latin equivalents for Pan and the Satyrs are Faunus and the Fauns (but the latter always have the sensual characters and the goat-legs of Pan). The Satyrs were great attendants upon Dionusos, and the kindred but coarser Silenus was this god's inseparable companion, often represented as overfond of the wine which accompanied its master and inventor in his numerous travels. The Nereids were the goddesses of the waves of the sea, some daughters of Okeanos, and others of an ancient sea-god Nereus. Triton was a son of Poseidōn, and his children, the Tritonids or Tritons, were the attendants of the god, blowing horns of twisted shell to herald his approach. The gods of rivers were considered as sons of Okeanos. The guardian goddesses of trees were the Dryads, those of mountains were the Oreads, those of pools were the Naiads, those of rain the Hyads, and all of these collectively were called Nymphs (Numplai), and were usually daughters of Zeus.



They held a middle place between the gods and men, perhaps comparable to our fairies, and many altars were set up to them in their silent and retired haunts. The myths about them are often exceedingly graceful and delightful. Two nymph-like goddesses attended upon the Olympians. Iris (the rainbow) was the special messenger of Zeus and Héra; she was daughter of Elektra, one of the countless children of the Titan Okeanos. The other, Hébè, was a daughter of Zeus and Héra, and was the guardian and preparer of that nectar or ambrosia which furnished the tables of the gods and kept them in perpetual youth. Specially attendant upon Apollo as the god of day was Eôs (Lat. *Aurora*), the dawn-goddess, daughter of the Titan Hyperion, with rosy fingers parting the clouds of night for the sun-chariot to pass. Her children, by Astraios (god of starry night), are the winds Boreas, Zephuros, Nôtos, Euros. Later she took as consort Tithônos, a lovely youth, for whom she begged and received the gift of immortality. It proved a dreadful curse, for as she had not asked for perpetual youth Tithônos soon became old, and dragged on a never-ending senile existence beside his ever-blooming partner. Asklepîos (Lat. *Æsculapius*), god of health, was the son of Apollo; Hygieia, goddess of health, was the daughter of Asklepîos. The Harpies, the Gorgons, the Graiai, the Sirens, the Centaurs, the Sphinx, the Chimæra, the Hydra, &c., are other creations of the exuberant fancy of the Greeks. They all find their due consideration under their separate headings.

*Demigods or Heroes.*—The mention of the monsters just noticed brings us to the demigods, whose adventures were largely composed of contests with them and their overthrow. The heroes are of divine origin, but mortal, although some, like Héraklès, achieve a sort of godship after death, and many are endowed with almost godlike powers during life. The twelve labours of Héraklès, though not the earliest, is the greatest group of myths; and the expedition of the Argonauts (in which Héraklès also took part) is almost equal to it in importance. Theseus, Jason, Meleagros, Orpheus, Pélus, Kastôr and Polydeukês (Lat. *Pollex*), Tudens, &c., who were among the Argonauts, are each one of them a centre for many myths. Then, considerably preceding these two in time, and with Argos for its scene, there is the great myth of Perseus, son of Zeus by Danaë, part of which takes in Andromeda's rescue and the previous contest with the Gorgons. Alkmênê, the mother of Héraklès, was granddaughter of Perseus, and thus these myths are connected. Blended with the Argive myth of Perseus is the Corinthian myth of Bellerophôn, with the overcoming of the Chimæra, by help of the wonderful winged-horse Pégasos, which sprang from Medousa's trunk when Perseus had cut off her head. Thebes had also its grand myth of Kadmos, descendant of Poseidôn and brother of Eurôpa, beloved of Zeus in the form of a bull. Kadmos ended his career by marrying the daughter of Arês and Aphroditê, and among their children was that Semelê, mother of the god Dionusos, whose fate has been already told. Another child was Poludôros, and his son, Labdakos, was parent of a house full of terrible fate, since he was father of Laios and grandfather of Oidipos, "Swell-foot" (the Lat. *Edipus*), vanquisher of the Sphinx. Antigônê and her brothers, children of Oidipos, suffer under the curse laid upon the house of Labdakos, and the whole fate is wound up by the expedition of the "Seven against Thebes." This series of myths is a never-failing source of inspiration for the poets and tragedians. It is connected with another Theban myth—that of Amphiôn and Zêthos, sons of the Regent of Thebes during the minority of Labdakos, who come before us first as their mother's avengers on the person of Dirke, whom they tied to a wild bull (subject of the famous group of statuary); and secondly—Amphiôn, that is—as the husband of Niobê (the snow) and parent of those children whose boasted loveliness drew

down upon them the vengeful arrows of Apollo. The horsemen of Thessaly gave rise to the myth of the Centaurs (Kentauroi), half men, half horses. These bring us again in touch with Theseus, for he came to the help of the Lapithai, when the marriage of one of them, his friend Peirithôos, with Deidamia, was disturbed by the Centaurs. Peirithôos was son of Ixion, the first man who murdered a relation. Ixion being purified of his crime by Zeus in Olympus is fabled to have dared to woo Héra, queen of heaven. Héra gratified his passion by shaping a cloud like herself, and giving him that unsubstantial partner. From this extraordinary union sprang the Centaurs. Some of the Centaurs were more civil than those who fought the Lapithai. Of these was Cheirôn, a very wise personage tutor of Jason and Asklepîos, friend of Pélus and Héraklès, and tutor of Achilles (Achilleus). So we touch the war of Troy at last, and reach the ground of legend rather than of myth. The great Thracian myth is of Orpheus and Eurudikê; the Cretan myth tells of Minos, Daidalos, and the Minotaur, and brings in Theseus again as the deliverer. For the myths surrounding the legends of Troy, see the article *ILIAD*. Nestor was the only one of the Argonauts who took a great part in the siege of Troy; the aid of Philoktetês, another Argonaut, was necessary to end it; and Helena, the cause of that great contest, was the sister of the Argonauts Kastôr and Polydeukês, and as a girl had been carried off by Theseus (another Argonaut) for her surpassing beauty. Many other close connections of the Trojan heroes with the Argonauts of the previous generation may readily be traced.

(Max Müller, "Lectures on the Science of Language" and "Comparative Mythology;" Cox, "Tales of the Gods and Heroes;" Grimm, "Deutsche Mythologie;" Kelly, "Indo-European Folklore;" Dr. Smith, "Dictionary of Greek and Roman Mythology," &c.; Lang, "Custom and Myth," London, 1885.)

**MYTILENE** or **MYTILENE**, the ancient *Lesbos*, is a large island of the Archipelago, near the coast of Asia Minor, being separated from the coast of Troas by the Gulf of Adramyti. Its length is 50 miles from Cape Sigrium, which is its north-western extremity, to Capo Malia, at its south-east end, which last looks into the entrance of the Gulf of Smyrna. The breadth of the island is very unequal, owing to some deep gulfs which indent its coast, and varies from 7 to 15 miles. Its estimated area is 300 square miles. Castro is the chief town. The island has many villages, and contains about 40,000 inhabitants, Greeks and Turks. It has good harbours, and is one of the most fertile and beautiful of the Greek islands. Its oil and figs are reckoned the best in the Archipelago. The interior is traversed by a range of mountains, rising to 3080 feet, clothed with pine woods. The principal products of the island are oil, pine, timber, grapes, figs, cotton, and pitch; its wine, anciently famous, is now inferior; and the corn raised is insufficient for the inhabitants. Mytilênê was captured by the Venetians in 1185, was recaptured by the Greeks, and at last seized by the Turks, who still retain it.

*Mytilênê*, in ancient times famous as the chief town of the island, stood opposite Asia Minor on a promontory of the east coast, with a harbour on either side. Under the early dictatorship of Pittaëus the Æolian Greeks, who formed the colony, sent out subcolonies into Mysia and Thrace, and at the beginning of the seventh century B.C. they were so strong as to dispute with Athens herself over one of these latter. Mytilênê fell to the Persians with the rest of Asia, and was foremost in the great Ionian revolt against that tyranny, which was the ultimate cause of the great Persian expeditions against Greece, ending respectively with Marathon and Salamis. Mytilênê had to share the disgrace of the Greek cities of Asia and send its contingent under Xerxes in the second invasion of its fatherland. After the overthrow of Persia the city entered the



Athenian confederacy. In the fourth year of the great Peloponnesian War (B.C. 428), Mytilênê considered that the power of Athens was broken, and suddenly deserting the alliance, made terms with Sparta, now rapidly rising towards success. The Athenians sent a fleet of forty triremes against Mytilênê, which at first resisted it; but seeing that the promised Lacedæmonian succours failed to arrive, the city at last capitulated, pressed by famine, just a day or two before the Spartan triremes were in sight. The Spartan admiral, fearing the prestige of Athens, sailed back home, and the ringleaders in the revolt, with some 1000 subjects of Mytilênê, were taken to Athens for judgment by the Athenian fleet. Here Kleôn, the leather-seller, whom Aristophanes in his spite has immortalized for us, was rising into prominence. He so played upon the excitable Athenian people that he actually got a law passed for the entire extermination of the whole male population of Mytilênê. A trireme was sent off with the order. Next day all Athens shuddered with horror at the crime, and at the earnest entreaty of the Mytilenean prisoners they assembled again, and in spite of Kleôn's frantic appeals they rescinded their decree, and sent a second trireme after the first to

countermand the order. The rowers were doubled, and worked turn and turn about without stopping, and fortunately reached Mytilênê before the massacre had actually commenced, though all was ready. As to the 1000 prisoners at Athens, Kleôn never rested till he got them all butchered. The utmost vengeance he could obtain on Mytilênê itself was the destruction of the fortifications and fleet, and the division of the whole territory among the Athenian people. Mytilênê never rose again. In common with the rest of Asiatic Greece she passed into the power of Mithradates, and fell under Roman domination after the overthrow of that great king. Mytilênê was the birthplace of the lyric poet Alkaios, of the exquisite and passionate poetess Sapphō, and of the dithyrambist Arion. It was, in fact, the centre of what was called the Æolian school of lyric poetry. Several Greek historians and philosophers were also natives of Mytilênê and its neighbourhood (Hellenikos, Theophrastos, &c.), and the father of Greek music, the great Terpandros, though his supreme triumphs were earned after his emigration to Sparta, originally sprang from this city or its environs.

**MYXINE.** See HAG.

## N

**N** is one of the consonants which used to be called *liquids* (*l, m, n, r*). It is more accurately defined as the nasal dental mute, *t* being the surd mute and *d* the sonant mute, which are its correlatives. [See MUTE.] *N* is formed with the tongue at the point where the teeth and palate meet, and the sound passes chiefly through the nasal passage.

The letter *n* is subject to the following changes:—

1. It is interchangeable with *nd*. Thus the Latin roots *fini-*, *gen-* (genus) appear in English as *bind* or *bound*, *kind* or *kin*.

2. Before *f*, *n* was silent in Latin. Hence the town *Confluens*, at the junction of the Moselle and Rhine, is now called *Coblenz*.

3. *N* final often becomes a more complete nasal, or equivalent to *ng*. Thus the German infinitive in *en* appears to be the parent not only of the participle in *end*, but of the substantive in *ung*, with which are connected the English participle and substantive of the same form in *ing*. The Sanskrit alphabet has a particular character for this sound.

4. *Ni* or *ne* before a vowel often forms but one syllable with that vowel, the *i* or *e* being pronounced like the initial *y*. This sound is represented in Italian and French by *gn*, as *signior*, *seigneur*; in Spanish by *ñ*, as *señor*; and in Portuguese by *nh*, as *senhor*—all derived from the Latin *senior*, elder.

5. *N* is interchangeable with *l*, as *flannet* for *flannen*, *postern* (Lat. *posterula*).

6. *N* with *m*, as *snack* (Old Eng. *snacc*, boat), *hemp* (Old Eng. *hanep*), *lime* (Old Eng. *lind*), *tempt* (Fr. *teuter*), *rellum* (Fr. *velin*), *megrim* (Fr. *migraine*), &c. So, on the other hand, *count* (Lat. *comes*), *ransom* (Lat. *redemptio*), *noun* (Lat. *nomen*), &c.

7. *On* and *o* are frequently interchanged. Hence the disappearance of the final *n* in the Latin nominatives *ratio*, *ordo*.

8. *N* with *th* and *d*. Thus the Latin often has *cn* where the Greek has *ath* or *as*, the English *ood* or *oom*, the German *ut* or *und*, as Greek *math* (in *manthanō*) and *men* (*menos*), Latin *mens*, English *mood* or *mind*, German *muth* and *wuth*.

9. *N* with *s*. This change will not be readily admitted without consideration, as the sounds appear so different. The change, however, is very parallel to the admitted change of *l* and *d*; and indeed, as the two latter letters are formed at the same part of the mouth, so are *n* and *s*. The close connection of the two letters will be most forcibly demonstrated by examples of suffixes in which the change occurs. Thus the English language has a double form of the plural suffix in *en* and *es*, as in *oxen* and *asses*. The Latin, again, has the *s* for a plural suffix in *scribinus*, *scribitis*, but the *n* in *scribunt*. Again, the Latin comparative has for its oldest suffix *ios*, as in the early *pleios* and *pleos*, whence the later forms *plous* and *plūs*. On the other hand, the Greek suffix is *ion*, as *ple-ion* and *pleon*, from the same root as the Latin *plus*, and with the same meaning. The suffix for a female in Greek is either *na* or *sa*, with perhaps an *i* prefixed, as *basilūna*, *melaina*, *keina*, or *basilissa*, *tuptousa*; and in English we have *ess*, while the Germans have *inn*. If the change be admitted, we see the cause of the anomaly in the Latin *pon-o*, *posu-i*, *positum*.

10. *N* before *s* is silent, but lengthens the preceding vowel. This fact is well exemplified throughout the grammar of the Greek language. The Latin has the same peculiarity. Hence *consul* was sometimes written *cosol*, and when abbreviated was always represented by the three first of the sounded letters, *cos*. So *ensor*, *infans*, *riciens*, *vicenismus* are often found in the form *esor*, *ifus*, *ricies*, *vicesimus*. The Germans write *uns*, *gans*, *veinschen*, and the English have *us*, *goose*, *wish*.

11. *N* is silent at times before *t* and *th*. The English word *mutton* is derived from the French *mouton* and the Italian *montone*; and our word *tooth* in the older Gothic dialects was *tuuth*, thus corresponding as nearly as it ought to do with the Greek *odont-* and Latin *dent-*, and *mouth* corresponds to the German *muud* and Latin *mentum*.

12. *N* before *n* is silent. Thus the Latin *convention-*, assembly, became *corention-* (as it occurs in one of the oldest inscriptions), before it was reduced to *contion-*, the assembly of the people, a word which modern editors, in spite of all the best MSS. and of etymology, persist in

writing with a *c* for the fourth letter. Similarly from *conventu* came the French *convent*; and though the English generally say *convent*, yet the name *Covent Garden* is a proof that the *n* was not always pronounced even here.

An initial *n* is sometimes prefixed to and sometimes taken from words by error. Thus *nadder*, a snake, has now lost its *n* through a confusion of the phrase *a nadder* with an *adder*; so an *apron* is used for the original *a napron*. On the other hand, the phrase *for then once*, i.e. *for this once*, in which the article has its old accusative form *then*, is now written *for the nonce*; so *nightingale*, *messenger*, *passenger*, all have an *n* thrust into their midst, to which the original *nachtigal*, *messenger*, *passager*, have no claim.

**NAAS**, a market and assize town of Ireland, in the county of Kildare, situated on the Grand Canal, 18 miles south-west of Dublin. The principal street is about half a mile in length, and contains the county court-house. The Protestant parish church is a modern edifice, in the Pointed style; there is also a Roman Catholic church, a convent, Presbyterian meeting-house, St. David's Preparatory School, Christian Brothers' School, National School, dispensary, fever hospital, and union workhouse; and close to the town are infantry barracks. The population in 1881 was 3,808.

The Irish *Nas* means a fair or market-place. The town was in early times the seat of the kings of Leinster, and a parliament met in it in 1419.

**NA'BOB**, a corruption (said to be derived from the Madras pronunciation) of the Hindustani *Nāib*, applied throughout India to the viceroy or governor of a province under the Mogul Empire. It denoted the highest office under the emperor, and it is still adopted by many of the Mohammedan feudatory chiefs of India. Under the rule of the British the term came to be applied generally to natives who were men of wealth and consideration, and in Europe, and especially in England, it was used to designate those Europeans who acquired fortunes in India and then returned to spend them in a style of Oriental extravagance.

**NA'DIR** (Arabic *nazer*, corresponding to *as'sant*, is the Arabic for azimuth or zenith, and the full phrase is *naziru 's 'sant*, corresponding to the zenith), a term applied to an imaginary point in the heavens diametrically opposite to the zenith, and consequently beneath the spectator's feet.

**NADIR SHAH** (*Tamasp Kouli Khan*), a celebrated Persian monarch, was born at the small village of Abuver, in Khorassan, 11th November, 1688. He was of very humble parentage, and in his youth was a soldier in the service of the governor of Meshed. Having been degraded for some real or supposed offence he joined a band of robbers, and soon became their captain. His courage and success attracted many adventurers to his service, and when he announced his intention to free the Persians from the detested rule of the Afghans multitudes flocked to his standard. In a short campaign in 1727 he conquered the Afghan forces, and expelled them from the country, and Shah Tamasp, the rightful heir, ascended the throne, Kouli Khan being rewarded with the governorship of some of the more important provinces. In 1731 he recovered Armenia from the Turks, and having quarrelled with and deposed Tamasp he elevated his infant son Abbas III. to the throne in 1732. Four years later, Abbas having died very opportunely, Kouli Khan was elected to the throne by the Persian nobles as Nadir Shah. Resuming the war with the Turks he regained Georgia, and then turning his attention to the Afghans he conquered them in 1738 and captured the city of Candahar. His ambassador to the Great Mogul having been murdered along with his suite at Jalalabad, Nadir invaded Hindustan, and in March, 1739, he seized upon Delhi. After a massacre of the inhabitants the city was sacked, and the immense treasure which had been amassed

in the course of two centuries by the Mogul monarchs fell into his hands. Laden with plunder to the value of £20,000,000, including the famous Koh-i-noor diamond, and the peacock throne, he returned to his dominions, and speedily reduced Bokhara and Kharezm to submission, restoring to Persia her limits under the golden reign of the Sassanids. But at this time a change is said to have taken place in his character, and he became avaricious, suspicious, tyrannical, and cruel. In 1743 he caused his eldest son Reza Kouli, a brave young prince, to be deprived of sight, and his treachery and cruelty towards those about him reached such a pitch as to lead to his own assassination 20th June, 1747. His only surviving son was carried to Constantinople and thence to Vienna, becoming finally an officer in the Austrian service under the title of Baron Semlin. In spite of his tyranny, Nadir is remembered with pride in Persia on account of his victories over the enemies of the country.

**NÆNIA** (Lat.), a funeral dirge anciently performed to the music of flutes. The Romans personified Nænia, and raised a chapel to the goddess outside the walls of the city near the Vinial Gate (now represented by the *Porta Chiusa*), where sacrifices were probably offered for the repose of the dead.

**NÆVIUS, CNEIUS**, born about 269 B.C., a native of Campania, and one of the earliest Roman poets, was older than Ennius, in fact the contemporary of Livius Andronicus. Nævius was a staunch plebeian, and was thrown into prison for his attacks on the aristocratic party of Scipio and Metellus, in his comedies (see Plautus, "Miles Gloriosus"). He served in the Punic War, and afterwards wrote an epic poem on it in the old Saturnian metre, "De Bello Punico," from which Ennius and Virgil extensively plundered. The famous storm in the first book of the *Æneid* is taken from Nævius, and many other of the more dramatic episodes and speeches. A fragment of Nævius' work is given in the article **LATIN LANGUAGE, Republican Period**. He died about B.C. 204.

**NÆVUS** (Lat. *nævus maternus*, mother spot or mole) is a congenital mark or morbid growth on a part of the skin. Nævi are of various kinds; some are merely yellowish or brown discolorations of the skin, without any evident alteration in its structure; but the greater number are composed of an excessively vascular tissue, or a dense network of arteries and veins, forming a reddish or livid substance, more or less elevated above the surface of the surrounding skin. A third kind are like extensive warty excrescences, and many of them are covered with thick-set coarse hair. Simple nævi rarely require treatment. When it is thought desirable to remove them, recourse is had to ligature, canterization, excision, or the blood in the large vessels may be coagulated by the injection of coagulating agents or by electrolysis.

**NAGASAKI** or **NANGASAKI**, a large town and the chief seaport of Japan, on the south-west side of the island of Kiu-siu. It is finely situated on the slope of hills overlooking the magnificent harbour, which extends north-east and south-west about 7 miles, being in most places less than a mile in width, with a depth of 5 or 6 fathoms close to the town, and protected from all winds. Owing to this circumstance, and also that in the neighbourhood are extensive coal deposits, Nagasaki is the main coaling station of the east of Asia. Its accommodation has been further increased by the construction of a large dock, with a length of 460 feet and a depth of 28 feet, a patent slip at Koski, and immense engine-works at Akao-nura. The port was opened to foreign trade in 1858, and imports cotton goods, kerosene oil, sugar, and general European goods. The exports consist chiefly of coal, rice, camphor, and to China for food purposes, dried cuttle-fish, sharks' fins, sea-slugs, &c. The population in 1882 was 39,566.

**NAGPUR**, a district in the chief-commissionership of the Central Provinces, British India, lying between  $20^{\circ} 36'$  and  $21^{\circ} 43'$  N. lat., and between  $78^{\circ} 17'$  and  $79^{\circ} 42'$  E. lon. It forms an irregular triangle, and has an area of 3786 square miles. The population is 650,000.

NAGPUR, the chief town of the district, and the seat of administration of the Central Provinces, is situated in the centre of the district, on a small stream called the Nag. The population is 90,000. The municipal limits include, besides the city proper, the suburb of Sitabaldi, the European station of Sitabaldi with Takli, and a considerable area of land (chiefly black soil) under cultivation. In the centre stands Sitabaldi Hill, crowned with the fort, which commands a fine view of the country round. Three great roads connect the city with the European station. The handsome tanks and gardens outside the city were constructed by the Marhatta princes. The three finest tanks are the Juma Talao, Ambajhari, and Telingkheri, which supply a considerable portion of Nagpur with water. The chief gardens are the Maharaj Bagh, in the station of Sitabaldi, the Tulsi Bagh, inside the city, and the four suburban gardens of Paldi, Shakardara, Sonagon, and Telingkheri. Of the numerous Hindu temples, some are in the best style of Marhatta architecture, with elaborate carvings. The Bhonsla Palace, built of black basalt, and profusely ornamented with wood-carving, was burnt down in 1864, and only the great "Nakarkhana" gate remains. The tombs of the Bhonsla kings are in the Sukrawari quarter, to the south of the city.

Nagpur has a large and increasing trade, the chief imports being wheat and other grain, salt, country cloth, European piece and miscellaneous goods, silk, and spices. The chief article of manufacture and export is cloth. The finer fabrics of Nagpur have long been famous, and are still, in spite of the competition of English stuffs, in great request. Most of the public offices are in the civil station of Sitabaldi, including the old Nagpur Residency, now the official residence of the chief commissioner, a plain but commodious building in well-wooded grounds, and the secretariat, a large and substantial edifice. The arsenal contains considerable stores and munitions of war. Both town and station are considered healthy.

**NA'AHUM.** "The book of the vision of Nahum the Elkoshite," which stands seventh in order among the writings of the minor prophets in the present arrangement of the canon, is wholly directed against Nineveh. Nothing is known of the circumstances of the author beyond the scanty title of his book, which gives no indication as to period or origin. The site of Elkosh, his birthplace, is disputed, some traditions placing it in Galilee, others in Assyria. Concerning the date of the utterance of his oracle there exists great difference of opinion, and there is hardly a reign from Jehu to Zedekiah to which he has not been assigned by one or another of the critics. There is much weight in the arguments in favour of the theory which assigns the prophecy to the troublous period of the reign of Manasseh, but the majority of modern commentators are in favour of the latter portion of the reign of Hezekiah. From internal evidence it is believed that the prophet was a man of Judah, and that his prophecy was delivered in Judea.

The oracle or burden commences with some emphatic utterances concerning the power and majesty of Jehovah, who is represented as being about to pour out his vengeance upon Nineveh, and effectually deliver his own people. Then the message changes, and a glowing vision of the siege of Nineveh, the wild excitement within its walls, the flight of its defenders, and the circumstances attendant upon its capture and sack, passes before us, the scenes being depicted with the most vivid and striking imagery. The book closes with a prediction of the utter downfall of the Assyrian Empire. The poetry of this book is of a very high order, and for literary beauty the oracle of the

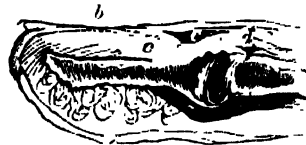
prophet Nahum stands in the first rank of the works belonging to the old Hebrew literature.

The reputed tomb of the prophet at Alkosh, the seat of the later Nestorian patriarchs, near Mosul, is a favourite spot for pilgrimages, and is revered alike by Jews, Christians, and Mohammedans.

**NAIADA/CÆ** are aquatic plants forming a small order of *MOXOCOTYLEDONS*, remarkable for the unusual simplicity of their organization. As they live constantly below water, their structure consists simply of cellular tissue. These plants are inconspicuous objects, inhabiting both fresh and salt water in all parts of the world. In this country we find the genera *Potamogeton*, a common inhabitant of rivers and ponds, elevating its little brown spikes of flowers above water during the time of fertilization; *Zannichellia*, a thread-shaped plant, with minute axillary flowers, constantly submerged; *Zostera*, or sea-wrack, with long, narrow, ribbon-like leaves, inhabiting estuaries of the sea. The flowers have both stamens and pistils, or these are in separate flowers, and sometimes the male and female flowers are on distinct plants. The perianth is sometimes wanting, or its place is supplied by two to six scales. The carpels of the ovary are superior, solitary, or if several they are distinct and one-celled. The seeds are without perisperm. The embryo has the radicular extremity inferior, with a rounded cotyledon, straight, curved or even rolled on itself, with the plumule in a cleft in its substance. There are 120 species, growing in all parts of the world.

**NAI'ADES** (Gr. *Naiades*, from *naô*, I flow) were one group of a class of female deities in the Greek and Roman mythology called *NYMPHS*. The Naiads presided over small rivers, brooks, and springs, and all forms of fresh water—hence differing from the Nereids and Okeanids, who were marine nymphs. They are represented as young and beautiful maidens.

**NAILS**, like hairs, are peculiar modifications of the epidermis. The ultimate cells forming the nail are rounded as usual, and they become more and more flattened and horny as they approach the upper surface and the extremity. The human nails, more especially those of the fingers, are hard, flexible, elastic, and translucent. When well formed they have a specific elongated character. For the sake of description the nail is divided by anatomists into root or matrix, body, and free portion. The root is



Vertical Section of the Extremity of one of the Fingers.

a, Epidermis; b, body of the nail; c, c, duplication of skin; d, the dermis.

covered on both surfaces, and is only seen on dissection; the body is covered only on one surface; the free portion is free on both sides. This free portion has a tendency, when left to grow to its full extent, to become incurved, and in consumptive persons remarkably so, probably through atrophy of the subjacent soft parts.

The root is about a fourth the length of the body of the nail, and is its thinnest part; it is received into a fold or duplication of the skin, c, c, to which it is attached by both surfaces; but these attachments are but slight compared with that by which the body of the nail is fixed to the sensitive parts beneath it. It is chiefly this connection which renders the tearing of the nails forcibly from their roots so very painful an operation. The nail is separated from the bone by a very thick portion of the dermis or true skin, exquisitely sensible, and very vascular. A fine part of the nail, at the part nearest to the skin, is called

the *lunula*; it is somewhat crescent-shaped, and is supposed to show a slight discoloration even in those mestizos whose blood might otherwise be supposed to be pure. As the nail constantly grows at the root, and from the necessity of the case cannot grow backwards, it is continually thrust forward as a whole along its bed, and thus appears to grow at its free extremity.

The form of the finger nails has been supposed, through a vast period of time down to our own days, to indicate the temperament and character of their owners, as, for instance, long and crooked nails indicated a false and cruel character; reddish nails were held to betoken a good wit. Broad nails pointed out a plebeian mind, almost ones a patrician race. Long nails, although attributed to Caliban by Shakspeare, are in Africa a sign of good race, and are cultivated in some parts over a fire of cedar wood; while in China old travellers describe them as being protected by cases of bamboo and silver, and a modification of this practice is said still to continue. Nail paring has often been considered a work of moment, and as to be done on certain days and not done on others, since an evil fate was sure to attend its performance either on Friday or Sunday. The ancient Romans considered it a bad omen were the cutting to be done in silence. Mussulmans on pilgrimage to Mecca bury their parings, while in Scandinavia nails are well cut to insure long life. Some parings are of sanctity, as those of St. Peter, still preserved at Aix-la-Chapelle, or those of St. Edmund, formerly at Bury St. Edmunds, &c.

The nails in man and the anthropoids differ from those of other vertebrates in their shape, as they tend so little to surround or inclose the ends of the fingers or toes. The opposite form is seen in the conjoined nail of the horse, ox, &c., which we call a *hoof*. An intermediate stage is shown in the sharp pointed nail called the *claw*, common to all birds and to the cat tribe. On the other hand we find the sea-bear (to whom, of course, nails would be useless appendages) with nails so small as not to reach to the end of the digits, and the porpoise is found to have none at all. The opposite case is shown by the sloths, which require their nails to help them to hold firmly to the boughs from which they hang head downwards, and here accordingly they extend to a relatively prodigious size. A similar development of claw-like nails is seen in the bats. In certain toads and efts the probably primitive form of nail is seen, whence these varied developments have all proceeded: this is simply a thickening of the epidermis at the ends of the digits.

The overlapping scales of serpents are horny or nail like investments of processes of the dermis, and the curious horny rings which form the rattle of the rattlesnake are undoubtedly referable to the same structure.

**NAILS**, short pointed rods of metal, usually furnished with heads, employed chiefly in wood-work to hold the pieces together, but which are employed also in upholstery, shoemaking, saddlery, slating, horse-shoeing, and various other trades. They have been known and used from the remotest antiquity, and from their simplicity and usefulness they were probably among the first implements formed when men discovered the use of the harder metals. In the Old Testament we read of "iron in abundance for the nails" in the enumeration of the stores accumulated by David for the building of the temple (1 Chron. xxii. 3), while the symbol of a nail firmly driven is used in more than one place as an illustration by the prophets. Originally all nails were hand-made, but at the present day, in addition to the hand-wrought nails, large quantities of which are still made, there are three other principal classes, viz. (1) machine-wrought and cut nails; (2) wire or French nails; and (3) cast nails.

The hand-wrought nails, which are made by separate forging from a rod of iron, are technically known as *wrought*

nails, and up to the present they still possess, notwithstanding all the improvements introduced into machinery, certain advantages over those made in any other way. The great centre of the nail trade of Great Britain is in the Midland hardware district, and the work is performed at the homes of the operatives, whole families being engaged in it. Small smithy-hearths, called nail-shops, are attached to their houses, and in these the nail-rods, after heating, are hammered on a low anvil, the nail length is cut off on a chisel attached to it, the head being formed by blows with a hammer. For the larger sized nails a mechanical hammer, called an "oliver," and worked by the foot, is employed. Hand-nail making is a very poorly paid industry, and the operatives, large numbers of whom are women and children, have to labour long and hard to earn a scanty pittance, while they are at the same time kept in a state of subjection and dependence by the middlemen or "foggers," who supply the material. The unsatisfactory condition of the nailers has been repeatedly brought before the public during the past twenty years, but nothing has been done towards the amelioration of their lot. It now seems likely, however, that the industry will be ultimately brought to an end by the improvements which are being made in the processes of making nails by machinery. Machine-wrought nails are produced in a variety of ways, in some processes the metal being worked in a state of heat, while in others metal rods or plates are cut into nails while in a cold condition. In the common flat-cut nails sheets of iron are first cut into strips or ribbons of a breadth equal to the intended length of the nails, and are then placed under the cutting-chisel, which descends with sufficient force to cut off from the end of the strip a nail at a single blow. As the nails are required to be of a tapering form the cutter is fixed so as to form a slightly oblique angle to the direction in which the strip is pushed into the machine, and the latter is turned over between every stroke, so that the points and heads are taken from opposite sides alternately. Wire or French nails are made from round wire by a process very similar to that used in making pins, except that the pointing is accomplished by the pressure of dies. Cast nails of large size are obtained by the ordinary casting process for horticultural purposes, as also are the hob-nails used by shoemakers.

**NAIRN**, a small county in the northern highlands of Scotland, bounded N. by the Moray Frith, E. by Elgin, S.E. by a portion of Inverness, S. by a portion of Elgin, S.W. and W. by Inverness. Its greatest length, N. by E. to S. by W., is 20 miles; its greatest breadth, at right angles to the length, is 16 miles. The area is 200 square miles. The population in 1881 was 10,455.

The southern part of the county is hilly; the hills form two irregular groups, separated by the river Findhorn, which flows through the county in a valley called Strathderm. Along the coast, which extends about 8 miles from E. by N. to W. by S., is a narrow border of level country extending inland from 1 to 6 miles.

The principal rivers are the Findhorn and the Nairn, both of which rise in Inverness and flow through the county in a north-eastern direction. The Nairn has about 11 miles of its course within or upon the border of Nairn, and falls into the Moray Frith at the burgh of Nairn. The Findhorn also traverses a like distance in this county, through which it passes to enter Elgin, where it has its outfall. A number of small streams flow into these rivers, especially into the Findhorn. There are a few small lakes or lochs, of which the largest are Cranloch and the Lake of the Claus.

The hilly part of the county is composed of granite and gneiss rocks; the lower part, of the old red sandstone. There is abundance of marl, which is valuable for manure. There is freestone in Nairn parish, and a few men are employed in the quarries. Peat is dug.

The soil is diversified. In the eastern part of the level tract along the coast it is generally a rich loam on a sandy or gravelly bottom; in the western part it is either a stiff rich clay or a sharp gravelly mould. In the mountainous districts it is chiefly a sandy loam, full of gravel and small stones. The climate in this part is cold and stormy, and the crops are later than along the coast, where the temperature is more favourable and remarkably equable.

There are no mines or manufactures of any importance in the county, except whisky. Nairn unites with Elginshire in returning one member to the House of Commons.

NAIRN, the only town in Nairnshire, is a royal burgh, situated on the west side of the river Nairn, which is crossed by a railway and a passenger bridge, at its entrance into the Moray Frith, 17½ miles N.N.W. of Edinburgh. It is an old town, in a pleasant spot, and much resorted to from the Highlands for sea-bathing, for which the sandy beach is admirably adapted. The place is remarkably healthy, enjoying an almost complete immunity from epidemic diseases, and it is one of the stations established in connection with the meteorological department of the Board of Trade. It is a sub-port of Inverness, which is 15½ miles distant by railway. It communicates with the south by steamers. The public buildings are—a parish church, Free church, United Presbyterian church, Congregational church, Roman Catholic church, and Scottish and English Episcopal churches, a county-hall, with court-house, town and county hospital, four banks, an academy, museum, a large and elegant marine hotel, salt and fresh-water baths, and an excellent harbour, with breakwater and pier. Nairn has a herring fishing and a small coasting trade.

The burgh was first chartered by William I. and is now governed by a provost, three bailies, and eleven councillors. Gaelic is still much spoken by some of the inhabitants, and the border line between the Highlands and Lowlands intersects the High Street. The population of the parish in 1881 was 5368; of the burgh, 4161. In the vicinity is Cawdor Castle, once a fortress of great strength, but now a ruin. It gave the title of "Thane" to Macbeth, and Shakespeare has made it the scene of the murder of the "Gracious Duncan." It now gives the title of earl to a branch of the Campbells of Argyll. Lord Lovat found refuge in a corner of this fortress, after the battle of Culloden, in 1746.

**NAMAQUALAND** is the name given to the western and maritime portion of the Hottentot country, in Southern Africa, the Great Namaqualand being north, and the Little Namaqua territory south of the Orange River.

**NAMAQUALAND, GREAT**, is the domain of the most characteristic type of the Hottentot race, and is generally a dreary region, with scanty and stunted vegetation. Its hills run parallel with the coast-line, forming the valley of the chief drain of the country, the Oop, or Great Fish, a periodically flowing stream. The coast is sandy and waterless, devoid of permanent streams or of harbours. Ivory and ostrich feathers are, however, obtained in considerable quantity in the interior, where cattle are also rather abundant. Large deposits of guano on Ichaboe and Possession Islands formerly attracted vessels to the coast, but these stores have been exhausted. The only road or track in the country is that leading from Angra Pequena Bay to the Rhenish mission station of Bethany (26° 30' S.), which stands at an elevation of about 4000 feet above the Atlantic, in the heart of Great Namaqualand. The district of Angra Pequena was occupied by Germany in 1884.

**NAMAQUALAND, LITTLE**, a division in the north part of the Western Province of Cape Colony, bounded on the N. by the Orange River; S. by the divisions of Clanwilliam and Calvinia; E. by Bushmanland; and W. by the Atlantic Ocean; with an area of 20,635 square miles, and a population of 18,000. It is a vast expanse of barren and rugged country, perfectly waterless, with an almost rainless climate,

and chiefly valuable for its immense mineral wealth, as yet but partially developed. Along the coast the country is covered with deep sand, making transport difficult, but a railway across the desert conveys the copper ores of the mountains to the port of shipment. The seat of magistracy is Springbok Fontein, about 60 miles from the coast, where was formerly a very rich copper mine, no longer worked.

**NAMES OF PERSONS.** The application of names to different individuals is coeval with the earliest history of the human race. Names are peculiar to every nation, and have always been considered as a part of the language of the people where personal names were in use. Most of them are intelligible where the national language has been transmitted to modern times; but owing to the gradual disuse of the words from which they were originally derived, there are many that cannot now be understood. Savage names arise sometimes from personal peculiarities or histories, as Laughing Water, Deutscher, &c., sometimes from the *totem*, as Sitting Bull, &c. Among the earliest Hebrews personal names were often commemorative of some remarkable incident or circumstance attending the family at the time of birth; thus Cain (meaning gotten or acquired) was so called from the exclamation of Eve, "I have gotten a man from the Lord." In a similar way were derived the names of the patriarchs of the twelve tribes of Israel.

The Greeks had always a distinctive meaning in their appellatives, as Periklēs (the renowned), Aristotélēs, whom we call Aristotle (good success), and Dēmōsthēnēs (the strength of the people). Anacharsis, the celebrated Scythian philosopher, who has been ranked among the seven wise men of Greece, has left us a very elaborate treatise on the origin and meaning of many of those names which are constantly occurring in Grecian history. There are some, says he, that derive their origin from certain relations which have been imagined between such a man and such an animal; as, for instance, León, a lion; Lakos, a wolf, &c. There are also some that appear to have originated from the colour of the complexion, as Argos, the white; Xanthos, the fair; and others from the name of a divinity, with a slight inflection, as Apollónios, from Apollo; Diogenēs, born of Zeus; Hēliodōros, gift of Hēlios, the sun-god, &c. The greater part of the names found in Homer are marks of distinction. They were given in honour of the qualities most esteemed in the heroic ages; as valour, strength, swiftness, prudence, and other virtues. From Greek *polemos*, which signifies war, have been formed, Tlepolemos, that is, able to support the labours of war, &c.; from the word *machē*, or battle, Tēlemachos, one who fights from afar, &c. Both Hebrews and Greeks had but the one name, unless, like the Russians of to-day with their Alexander Alexandrovich, &c., the father's name was added for particularity, as David the son of Jesse, Sokratēs the son of Chrusippos, &c. The same rule obtains in Iceland to this day; the richest lady in the village is simply Guanhild to the poorest beggar in the street, or, as is now becoming more common, Guanhild Magnúsdóttir (daughter of Magnús). The latter form, as in Palestine and Greece, is not only held to be clearer but more polite. But the fact remains that in Iceland now, as once in Greece, the smallest man cannot and could not call the greatest by any but his own personal name.

The Romans, in their early history, had also but one name, as Romulus, Remus, &c.; soon becoming two, as Numa Pompilius. Afterwards, when they became divided into numerous clans and families, they used three names, the *prænomen*, the *nomen*, and the *cognomen*. The *prænomen* marked the individual (like our Christian name), as Marcus; the *nomen*, the gens or clan, as Tullius; and the *cognomen* the family, as Cicero. Thus we have Marcus Tullius Cicero, or Gaius Julius Cæsar. To these names sometimes was added a fourth, which was called the *agnomen*.

men, from some illustrious deed; thus Publius Cornelius Scipio was surnamed Africanus, from his conquest of Africa. Foreigners bore the nomen and prænomen of the individual by whose means they obtained the privilege of Roman citizenship. Slaves on being manumitted received the names of their masters, preserving their own names by way of cognomen. Roman surnames generally had their origin from some peculiar characteristic of body or mind; as Cato, from *catus*, wary or subtle; Crassus, fat; Calvus, bald; Cicero, vetchgrower, &c. Aristocrats were nearly always addressed by their family name, Cæsar, Cicero, &c. To call such men by their gentile name would confound them with all the Julii and Tullii of Rome; while the personal Gaius or Marcus would smack of familiarity, and its use was restricted, except in the earliest time, to relations and intimates. Under the republic a lady was in hard case. She really had no personal name at all. All the daughters of every man of the great Cornelian gens or clan were called Cornelia, all those of the Julian gens were called Julia. Under the empire personal names gradually came to the noble ladies, and we find in the same family (children of Germanicus), the sisters Drusilla, Livilla, Agrippina, &c., where formerly all would have been alike Claudia or Julia. (Germanicus, by birth a Claudius, was by adoption a Julius.) It is a little hard now to see how, without a long circumlocution, a particular lady was distinguished, when one of the more numerous households was in question, and when there were perhaps a dozen Julias or Fabias to choose from.

In modern times, the names of individuals have been of two kinds—Christian- and sur-name; the one received at baptism, and the other being the family name. But European surnames are comparatively of modern introduction. [See the article *SURNAMES*.] Before the arrival of the Normans in this country men were usually named from their condition, residence, profession, or peculiarities of body or mind. Afterwards, scriptural names, or such as were applicable to some peculiar quality or office, were introduced as prænomena; thus we have John, Thomas, Stephen, Peter, James, Edward, Henry, &c. Females also received Christian names, which had their distinctive meanings. Thus, Mary and Maria signified exalted; Isabel, lovely; Martha, bitterness; Gertrude, all truth; Julia and Juliet, soft-haired; Ellen, alluring; Caroline, regal; Charlotte, a queen; Eliza and Elizabeth, true; Clara, bright; Agnes, chaste; Amanda, amiable; Laura, laurel; Edith, joyous; Olivia, peace; Phœbe, light of life; Grace, favour; Sarah, a princess; Sophia, wisdom; Amelia, beloved; Matilda, a noble maid; Margaret, a pearl; Rebecca, plump; Hannah and Anne, kindness; Jane, dignity; Lucy, brightness of aspect; Louisa, one who protects; Emma, tender; Catherine, pure; Frances, frank. Some of the affected quaint Puritan names cause a smile even now. Praise-God Barbone, the worthy leatherseller from whose nickname the "Barebones" Commonwealth Parliament is named, had a son with the absurdly arranged name "If-Christ-had-not-died-for-thee-thou-hadst-been-dunned Barbone," and as it was evidently necessary to shorten such an appellation, the two final words were usually taken as the poor man's name, to the complete overthrow of the pious design of its originator, and the scandal of the godly. In Dorchester County, Md., on the Choptank, near Cambridge, in America, there still lived in 1885 two unfortunate persons with the names respectively "Julia Jane Augusta Dominica Rustis Ro Bo Bustis Jack" and "John Henry Land-Runner Run-out-and-Survey Baudana Beaver-Dam Rendezvous God Bless Bæticue." The best book on the general subject is the "History of Christian Names," C. M. Yonge, first published London, 1863. See also the article *SURNAMES*.

**NAMUR**, a city of Belgium, the capital of the province of the same name, is situated 35 miles S.E. from Brussels, at the confluence of the Sambre and the Maas, and in 1883

had 26,008 inhabitants. It is strongly fortified, entered by eleven gates, and commanded by a strong citadel, built on a rock, from which there is a beautiful view of the town and the two rivers. The streets are wide and clean: the houses are chiefly built of a bluish stone, and are slated. There are several squares; and bridges over the Maas and over the Sambre; a town-hall, public library, several churches, St. Loup and Notre Dame being the most noteworthy; and a cathedral, dedicated to St. Aubin, which is considered one of the finest in Belgium. The pulpit is considered a masterpiece of oak carving. The situation of Namur, at the confluence of two navigable rivers, is favourable to commerce. The principal manufactures are—superior cutlery, for which it is celebrated; surgical instruments, copper utensils, iron, steel, and bronze articles, &c. There are also glass works and tanneries. Namur has sustained numerous sieges, was taken by the French in 1692, by the English and Dutch in 1695, and again by the French in 1701 and 1746. Under the first French Empire it was the capital of the department Sambre and Meuse. The iron, lead, and coal mines and marble quarries of the neighbourhood give employment to a large portion of the population.

**NANNA SAHIB**, the author of the massacre at CANNORE during the great Indian Mutiny, was the adopted son of the last Peshwa of Bithur. In spite of the efforts made on all hands by the exasperated English soldiers this ruffian escaped and was never more heard of. Once or twice Indians were captured who were believed to be the Nanna, but the identification always broke down.

**NANCY**, once the capital of Lorraine, now of the French department of MEURTHE-ET-MOSELLE, is situated on the left bank of the Meurthe, 221 miles east from Paris on the Paris-Strasbourg Railway, and had 69,481 inhabitants in 1886. It is built in a beautiful and fertile plain at the foot of wooded and vine-covered hills, and the stateliness of its public buildings, and the extent and beauty of its squares and public walks, render Nancy one of the handsomest of the great towns of France. The Place de la Carrière is the finest of the squares: one side is formed by the town-hall, containing a gallery of pictures; two other sides are occupied by the prefect's hotel, the custom-house, the theatre, and some private houses. In the angles of the square are four fountains, and in front of the town-hall a triumphal arch in honour of Louis XV. It also contains a statue of Stanislas Leszcinski, who, after abdicating the crown of Poland in 1735, continued to reside in the town as Duke of Lorraine, till his death in 1766, and to whom the city was indebted for many improvements. Two streets run in a direct line from this square to two of the town-gates, which are built like triumphal arches. There are in Nancy several richly ornamented churches. The cathedral is not remarkable except for a portal with a triple row of columns, and for the high altar. The little church of Bon-Secours, in the suburb of St. Pierre, built over the spot whereon Charles the Bold, the last duke of Burgundy, fell in battle, 5th January, 1477, is adorned by the monuments of Stanislas Leszcinski and his wife. In the old town is the ancient Gothic castle, the former residence of the dukes of Lorraine; and adjacent to it is a small church of Gothic architecture, the burial-place of the ducal family. The tomb of René II. and some others are in the church itself; others are in a round chapel attached to the choir. The other important structures are—the university buildings, in which is the public library of 40,000 volumes; the college buildings; the infantry and cavalry barracks; the theological college; five hospitals, one of which is a house for foundlings; and the public baths.

The inhabitants manufacture hosiery, embroidered muslin (for which they are celebrated), hats, cotton yarn, woollen cloth, calico, lace, oil, chemical products, liqueurs, and leather. Trade is carried on in the various articles manu-

factured, and in corn, wine, brandy, hides, wool, and iron. There are two yearly fairs, one of which continues twenty days.

Nancy is the seat of a bishop, whose see is the department of Meurthe. It has tribunals civil and of commerce, a chamber of commerce, a college, a museum, a medical school, a botanic garden, a scientific, literary, and artistic society, and several charitable institutions.

Nancy was taken by Charles the Bold in 1475, but he was killed while again besieging it in 1477. Louis XIII. captured it in 1634. Its citadel is still preserved.

**NAN'DU.** See RHEA.

**NAN'NI** was the name of two brothers of great eminence in the early history of modern music, Giovanni Maria and Giovanni Bernardino Nanini; born the one about 1540, and the other about 1550. The elder brother was a pupil of Goudimel's school at Rome, and a fellow student of Palestrina, whom he succeeded as director of the choir at the Basilica of St. Maria Maggiore at Rome. He now opened a music school at Rome, the first ever held by an Italian. Among his pupils was his brother, who with Palestrina later on formed his chief assistant. He was a member of the Pope's choir, and wrote much for that celebrated body. He died 1607. His motets are still sung in the Sistine Choir; and many of them are very enjoyable, even at the present day. His brother (died about 1620) was also an excellent writer, and some of his madrigals are among the ornaments of the early madrigalian epoch. Compositions of both the brothers will be found in Proske's "*Musica Divina*." The School of the Nanini trained many of the musicians of the time. An excellent treatise by both brothers on extempore counterpoint exists in manuscript, showing their great learning and command of all resources of the art.

- **NANKING'**, a city in China, situated on the south bank of the river Yang-tse-Kiang, and the capital of the empire till the end of the thirteenth century, when it was much larger than it is at present. The ancient walls can be traced for 35 miles, but the modern walls are of much less extent, and the town scarcely occupies one-eighth part of the surface inclosed by them. The place is divided into a Chinese and a Tartar town, separated by walls and gates.

The most celebrated object in the city was the famous Porcelain Tower, which is unfortunately now in ruins. This building was octagonal. The height was about 200 feet, and each side of the base measured 40 feet. It consisted of nine storeys, all of equal height, except the ground-floor, which was somewhat higher than the rest. The wall was composed of bricks. On the exterior they were white, and had the appearance of porcelain. At the termination of every storey a roof projected some feet, at the projecting corners of which small bells were fastened, which sounded with the slightest breeze. On the summit of the tower was a brass gilt ornament in the form of the cone of a fir tree. This beautiful edifice was completed in 1432, and destroyed in 1858 by the imperialists, to prevent the rebels making it a fort. It was erected by the Emperor Yung-loh, as a tribute of respect for his mother, and its construction occupied a space of nineteen years. Among other interesting objects are the "tomb of kings," supposed of the Ming dynasty (1328 to 1621), leading to which is a fine paved road, with an avenue of gigantic armed figures; the governor's palace; and an observatory.

From 1858 to 1864 the Tai-ping rebels made this city their headquarters, and the interior of the town was left in ruins. There were formerly manufactures of crape, satin, paper, artificial flowers, China or Indian ink, and nankeen; but for years its industrial manufactures have ceased, and its trade is now of very little importance. It has, however, an extensive military and naval arsenal.

Nanking was invested by the British forces in August, 1842, and the Chinese were compelled to sue for peace.

The treaty ceded Hong Kong to Great Britain. This city communicates directly with Peking by the Great Canal, which crosses the Yang-tse-Kiang, about 40 miles to the eastward. The name signifies "court" or "capital of the south;" Peking, "court of the north."

Nanking was taken by the insurgents in 1853, and was for a time their capital. Not one of the Tartars who were captured was spared. "We killed them all," said the ruffians; "we left not a root to sprout from. The bodies were thrown into the Yang-tse." This movement first became prominent in the autumn of 1850, under Hung-tsin-tsen, a man of humble origin, educated in a Protestant missionary school in the south of China, and a disappointed candidate for government employment. He professed to have a mission to uproot the Tartar dynasty and re-establish native rule. Rapidly gathering strength, the Tai-pings overran all Southern China, and established themselves at the southern capital of Nanking; afterwards marching northward their army reached to within 80 miles of Tien-tsin, where they encountered the imperial forces in a long contest, and after many defeats were obliged to fight their way south again. Till 1860, however, the provinces in the lower basin of the Yang-tse remained in their hands, when the imperial forces, with the aid of a British leader, the great General Gordon, began a final campaign which lost the rebels every important position. It was not till 1866 that the last embers of this great insurrection were trodden out in Kwang-si, the original nest of its origin. The population of Nanking was once estimated at 4,000,000. It is now little more than 300,000.

**NAN'NI, GIOVANNI**, called *Giovanni da Udine*, was born at Udine in 1487. Under the direction of Raphael he executed the greater part of the grotesque ornaments in plaster in the loggie and other apartments of the Vatican. He is considered as the most eminent artist in this branch. After the sack of Rome he visited other parts of Italy, and many of his works are at Florence, Genoa, and Udine. He died in 1564.

**NANTES**, a large seaport town, the capital of the French department of Loire-Inférieure, beautifully situated on the right bank and about 30 miles from the mouth of the Loire, at a distance of 240 miles by railway south-west from Paris. It had 127,482 inhabitants in 1886. Though the increasing sandbanks in the Loire render navigation more difficult and dangerous than formerly, the city is admirably situated for commerce, having communication with the interior by railway, and by steam-boats up the Loire, which forms the harbour. The Erdre, which enters the Loire from the north, and the Sèvre-Nantaise, which empties its waters into the Loire just below the town, are both navigable streams. Besides these facilities for traffic, Nantes has communication by canal with Brest. The town is well built, very clean, and well laid out, especially in the more modern part, which is remarkable for the regularity and elegance of its squares and public places; the Isle of Feydeau (which is surrounded by fine quays, and joined to the town by a handsome bridge), the Graslin quarter, and the Place-Royale, will bear comparison with the finest parts of Paris. Indeed the quays, which extend 2 miles along the Loire and along both banks of the Erdre, the magnificent river covered with craft of various sizes, the islands, the meadows that stretch along the river bank opposite the town, the bridges across the Erdre and the arms of the Loire, and the harbour of Lafosse, form a striking and beautiful picture. The quays, planted with trees, and backed by large warehouses and other buildings, form very handsome promenades. But the most delightful of the public walks is that formed by the Cours St. Pierre and St. André, which run from the Loire to the Erdre, passing the old castle of the dukes of Bretagne.

The most remarkable objects in Nantes are—the ancient castle, built in 938, the birthplace of the Duchess Anne,



which stands on the banks of the Loire, and was the temporary residence of most of the kings of France from the time of Charles VIII.: its chapel is now a powder magazine; the Castle of Bonifay, which is now used as a prison; the Cathedral of St. Pierre, in which the portal entrance, the wood carving, and the stone tracery of the organ loft in the nave, are greatly admired; the south transept contains the splendid mausoleum erected by the Duchess Anne to Francis II., the last duke of Bretagne, and his wife, Margaret of Foix; the prefect's residence, one of the finest modern structures in Nantes; the exchange, which is adorned with several statues; the theatre, which stands in the Place Graslin; the museum of natural history; the picture gallery, which contains several pictures by the great masters; and the public library, which is on the Quai Braconnier, and contains 50,000 volumes, besides several valuable manuscripts. The Place Royale, which presents a figure of nine sides, is formed by as many masses of buildings constructed on a symmetrical plan; the ground floors are occupied as shops, which for elegance and splendour are not inferior to those of Paris or London. The Place Graslin is smaller than the Royale, but it is magnificently built, and contains several fine hotels. Suburbs are built on several of the islands and connected by bridges.

Among the industrial establishments of Nantes are—shipbuilding yards, cotton, wool, and hemp factories, copper and iron foundries, and gas and water works, which employ a considerable portion of the labouring class; a palm-oil soap factory, saw-mills, currieries and tanneries, sugar refineries, and a government tobacco factory, where a large number of women are employed.

Though not so great as formerly, the commerce of Nantes is still very considerable, and its trade extends to India, Africa, the colonies of America, and China. A few years ago about 3000 vessels annually arrived at and departed from this port; but in proportion as the mercantile marine of St. Nazaire has increased of late years, the shipping of Nantes has declined. The exports consist chiefly of grain, wine, flour, and sugar; and the imports of coal, iron, timber, coffee, iron ore, salt, sulphur, pepper, &c.

Nantes gives title to a bishop, whose see is the department of Loire-Inférieure. It is the headquarters of a military division, and contains tribunals civil and of commerce, an exchange, a council of prud'hommes, a bank, custom-house, a mint, a school of hydrography, a college, an ecclesiastical college, a school of medicine, Catholic, Jewish, and Protestant colleges, normal school, observatory, botanic garden, museum of natural history, antiquities, &c., and several literary and benevolent institutions.

Nantes takes its name from the ancient *Nametes*, whose capital it was. Among the important events in its more modern history are—the marriage of the Duchess Anne to Louis XII. in 1499, which united Bretagne to France; the issuing of the edict of Henry IV., 30th April, 1598, by which the Protestants were guaranteed the free exercise of their religion, under certain restrictions; the revocation of this edict by Louis XIV. in 1685; the fierce but unsuccessful attack which the town sustained (29th June, 1793) from the Vendéens under Cathelineau; the unparalleled butcheries committed soon after by Carrier and other republican agents; and the arrest of the Duchess de Berry, 7th January, 1832.

**NANTWICH**, a town of England, in the county of and 18 miles S.E. of Chester, on the Birmingham and Liverpool Canal and river Weaver, and 162 miles from London by rail. It was formerly noted for its salt springs, but there is now only one brine bath, erected in 1883. Its chief branches of industry are the manufacture of shoes for the London market, silk, cottons, and gloves; and in the surrounding fine country, cheese of superior quality. The town is old and quaint, the chief buildings are, the parish church of the fourteenth century, the ancient hall

of the Guild of Nantwich, the grammar-school, and a modern town-hall. The population in 1881 was 7495. Nantwich, mentioned in Domesday simply as "Wich," was the scene, in 1069, of an unsuccessful attempt by the Cheshiremen to resist the advance of the Normans. In 1438 and 1583 the town suffered considerably from fire; and during the parliamentary wars it was besieged by the royalists under Lord Byron, but soon afterwards relieved by Sir Thomas Fairfax. It also deserves notice from Laving been the birthplace of General Harrison, one of the regicides, and of Milton's widow, who died here in 1726.

**NAPHTHA** (Persian *nafata*, to exude). Native naphtha, petroleum, or rock-oil exudes from the earth in certain parts of Asia, in Persia, and Rangoon, and is also associated with asphalt, as in the great Pitch Lake of Trinidad. It has been long known; it is mentioned by the Greek historians as exuding from the ground in various parts of Chaldæa, and particularly near Babylon. It is related that at Memmis there was a celebrated fountain which threw out its naphtha in such quantities that in building the walls of Babylon it was used to form the concrete. It is supposed to have been the perpetual fire of the Persians. Historians relate that on the arrival of Alexander at Babylon he was struck with wonder at seeing a vast gulf that poured forth streams of fire and a flood of naphtha, which, overflowing from its extraordinary quantity, formed a great lake near the gulf. This naphtha is described as being exactly like bitumen; but it had the property of taking fire so very suddenly that, before it touched a flame, it ignited merely from the light that surrounded the flame and set the air between both on fire. The barbarians, being desirous of showing the king the strength and subtle nature of this combustible substance, scattered several drops of it up and down, after his arrival in Babylon, in that street which approached the house he had chosen for his residence. After this, going to the other end of the street, they brought torches near the places where those drops had fallen (for it was night), and those which were nearest the torches taking fire on a sudden, the flames ran in an instant to the other end, by which means the whole street seemed in one general conflagration. These ancient naphtha wells have their modern representatives in the spouting petroleum wells of America and of Russia, which have given rise to a gigantic industry in which an immense amount of capital is engaged, and which has revolutionized domestic lighting. See PETROLEUM.

There are several liquids bearing in commerce the name of naphtha. For wood naphtha see METHYL-ALCOHOL.

Coal-tar naphtha is obtained by rectifying the light oil, which is the first product from the distillation of coal tar; it consists of hydrocarbons of the benzene series, and contains benzene ( $C_6H_6$ ), toluene ( $C_7H_8$ ), xylene ( $C_8H_{10}$ ), cumene ( $C_9H_{12}$ ), and cymene ( $C_{10}H_{14}$ ). It is used for burning in lamps, but is specially valuable for the two first hydrocarbons, benzene and toluene, which are converted into nitrobenzene and nitrotoluene, and then into aniline and toluidene, which form the bases of the coal-tar colours.

Boghead or Bathgate naphtha is the light oil from the paraffin oil obtained from the Boghead coal and other shales by distilling at a low temperature. It contains no benzene, and consists mostly of hydrocarbons of the paraffin series, as hydride of hexyl or sextane ( $C_6H_{14}$ ), hydride of octyl or octane ( $C_8H_{18}$ ), and hydride of decetyl or decane ( $C_{10}H_{22}$ ). It is used principally as a solvent in varnishes, for dissolving caoutchouc, and instead of turpentine in mixing paints.

Petroleum naphtha, petrolene, or gasoline, is obtained from the light oil in the first distillation of PETROLEUM. It contains hydrocarbons similar to those of the Boghead naphtha, and is employed for the same purpose; but it contains no benzene, and neither of these naphthas can be used in colour making.



Bone naphtha is the light oil obtained in the destructive distillation of bones; it also consists mainly of hydrocarbons.

**NAPHTHALASE**, a yellow substance obtained from nitronaphthalene. It is soluble in water but insoluble in alcohol and ether. It sublimes without melting at  $250^{\circ}\text{C}$ . ( $482^{\circ}\text{Fahr.}$ ), and boils at a higher temperature. The formula is  $\text{C}_{20}\text{H}_7\text{O}$ . With sulphuric acid it forms a splendid violet colour.

**NAPHTHALENE**, a solid crystalline hydrocarbon, obtained in considerable quantity as a by-product in the distillation of coal-tar. It is often found in large lumps in the street gas mains. It crystallizes out from the heavy oils in large quantities, and for a considerable time met with no commercial application. It is now, however, largely used as a means of increasing the illuminating power of ordinary coal-gas. It is melted in a special reservoir burner, known as the alho-carbon, and the gas allowed to pass through it before lighting. It is a beautifully crystalline substance with a strong tarry odour; it melts at  $79^{\circ}\text{C}$ . ( $174^{\circ}\text{Fahr.}$ ), and sublimes at  $218^{\circ}\text{C}$ . ( $424^{\circ}\text{Fahr.}$ ) It is insoluble in water, but soluble in alcohol, ether, oils, and also in acetic acid. The formula is  $\text{C}_{10}\text{H}_8$ . It burns with a dense smoky flame, and has been used for the manufacture of lampblack. It is now manufactured from coal-tar on a very large scale. It yields a great number of compound chlorine and bromine derivatives, which are mostly crystalline, of which the first in the two series are chloronaphthalene ( $\text{C}_{10}\text{H}_7\text{Cl}$ ) and bromonaphthalene ( $\text{C}_{10}\text{H}_7\text{Br}$ ). Nitric acid produces two nitro-derivatives, nitronaphthalene and dinitronaphthalene; the latter by the action of reducing agents yields nitrosunaphthalene, which is a beautiful red-colouring matter.

Naphthalene is employed in medicine for antiseptic dressings, and as an external application in some skin diseases.

**NAPHTHIONIC ACID**, an acid obtained in colourless silky crystals from nitronaphthalene, by the action of reducing agents. It is very slightly soluble, either in water or alcohol. The formula is  $\text{C}_{10}\text{H}_9\text{NSO}_3$ . It forms a number of crystalline salts, mostly soluble in alcohol, and called naphthionates. These solutions are opalescent, and transmit various shades of red and blue colours, which are extremely characteristic.

**NAPHTHYLAMINE** or **NAPHTHALIDINE**, a base obtained by the action of reducing agents on nitronaphthalene. It crystallizes in silky needles, which melt at  $50^{\circ}\text{C}$ . ( $122^{\circ}\text{Fahr.}$ ) and sublime unchanged at  $300^{\circ}\text{C}$ . ( $572^{\circ}\text{Fahr.}$ ) It has an extremely offensive and persistent odour, and burns with a smoky flame. The formula is  $\text{C}_{10}\text{H}_9\text{N}$ . It turns violet on exposure to air. With oxidizing agents it gives rise to a number of colouring matters, one of which is blue, and called oxynaphthylamine. Another is red, and called azodinaphthylamine ( $\text{C}_{20}\text{H}_{16}\text{N}_2$ ); it crystallizes in splendid crystals, having a green reflection. Naphthylamine is a strong base, and forms numerous crystalline salts, mostly soluble in water and alcohol. The hydrochlorate,  $\text{C}_{10}\text{H}_9\text{N.HCl}$ , crystallizes in needles which sublime unchanged at  $200^{\circ}\text{C}$ . ( $392^{\circ}\text{Fahr.}$ ) The hydrobromate,  $\text{C}_{10}\text{H}_9\text{N.HBr}$ , is a similar salt. The nitrate,  $\text{C}_{10}\text{H}_9\text{N.HNO}_3$ , and the sulphate,  $2(\text{C}_{10}\text{H}_9\text{N})_2\text{H}_2\text{SO}_4$ , are also crystalline and soluble salts. The chloroplatinate and chloromercurate crystallize from boiling water in yellow scales.

Some fine red and blue colours have been recently obtained from naphthyl compounds, and are rapidly coming into use in dyeing.

**NAPIER, SIR CHARLES**, a British admiral, born 6th March, 1786, was the second son of Captain Napier of Merchiston Hall, grandson of Francis, fifth Lord Napier, and cousin to the three famous Napiers, Sir Charles, Sir George, and Sir William. He entered the navy as midshipman in 1800, was promoted lieutenant in 1805, and commander in 1807. He distinguished himself in the West

Indies, and captured the *Hautpoul*, a French seventy-four, in which ship the admiral placed him as captain. On his return home he was confirmed in his rank, but put upon half-pay, and after spending some time in the University of Edinburgh, he went out to Portugal to visit his cousins, and was wounded at Busaco. On his return home he was appointed in 1811 to a naval command in the Mediterranean, where he rendered himself so formidable by his daring and reckless exploits that he was known and feared as "Mad Charlie" along the whole of the French and Italian Mediterranean coast. In 1813 he served on the coast of America, and he led the way in the hazardous ascent and descent of the Potomac. He was made a C.B. in 1815, and being paid off married a Mrs. Elers, a widow with four children. He settled at Paris, where he lost all his capital in unfortunate steamboat speculations, and in 1829 he was appointed to the *Galatée*. In 1833 he entered the service of the constitutional party of Portugal, and was appointed to the command of the Portuguese fleet. He defeated the Miguelite fleet off Cape St. Vincent, 5th July, 1833, and for his success was created full admiral and Viscount Cape St. Vincent in the peerage of Portugal. His zealous attempts, however, to reorganize the navy of that country were thwarted by official imbecility until he quitted the Portuguese service in disgust, and returning to England his name was restored to the navy list, and he was appointed to the *Powerful*, eighty-four guns, on the Levant station. When the war broke out between the Porte and Mehmet Ali, he was sent to Syria and appointed second in command. Here he defeated the Egyptians at Kelbzer, stormed Sidon, 26th September, 1840, and for this and other important services was made a K.C.B. In 1841 he went on half-pay, and in 1842 was returned in the Liberal interest for Marylebone, but lost his seat in 1846. He commanded the Channel fleet from 1846 to 1848, but was suspended by Sir Francis Baring on account of his attacks on naval maladministration. On the outbreak of the Russian War Sir Charles was appointed to the command of the Baltic fleet, hoisting his flag in February, 1854. With ill-manned ships and destitute of pilots and gunboats, he effected little beyond the capture of Bomarsund, 16th August. On his return to England in December, he was deprived of his command, his request for a court-martial being refused. In 1855 he was elected member of Parliament for Southwark, and retained his seat until his death 6th November, 1860.

He was the author of a "History of the War of Succession in Portugal" (1836); "The War in Syria" (1842); "The Navy, its Past and Present State" (1851); and he furnished materials for Mr. Earp's "History of the Baltic Campaign." (See Major-General E. Napier's "Life and Correspondence of Admiral Sir Charles Napier, K.C.B.," two vols. London, 1862.)

**NAPIER, SIR CHARLES JAMES, G.C.B.**, a distinguished military officer, was the eldest son of the Hon. George Napier and Lady Sarah Lennox, and born on the 10th of August, 1782. His early years were passed in Ireland, where he was educated by his father, and gave abundant proofs of his daring courage and resolute will. At the age of twelve he obtained, 31st January, 1794, an ensign's commission in the 22nd Regiment of foot, and was gazetted a lieutenant on the 8th of the following May. After various changes, Charles Napier was promoted in 1806 to a majority in the 50th, and in the absence of its colonel, commanded the regiment during Sir John Moore's advance into Spain, and the famous retreat which terminated with the battle of Coruña. In the fight he showed the most brilliant valour, received five wounds, was taken prisoner, and was only saved from a cruel death by the humanity of a Frenchman named Guibort. Marshal Ney treated him with great kindness, and released him upon his recovery from his wounds, on condition that he did not

serve until exchanged. In January, 1810, Napier returned to his regiment, and in a few months later joined Wellington's army in the Peninsula as a volunteer. He distinguished himself at the Coa, and again at Busaco, where he was severely wounded in the face. After sharing in the victory of Fuentes d'Onore and the siege of Badajoz, he was recalled to England to reorganize the 102nd Regiment, of which he had been appointed lieutenant-colonel. He was at Bermuda, and in North America, during the campaigns which culminated in the "crowning glory" of Waterloo, but returned in time to assist at the storming of Cambray.

He was now put on half-pay, but improved his leisure by the study of military strategy. Appointed military resident at Cephalonia in 1822, with characteristic energy he devoted himself to the improvement of the island and the development of its resources; built moles and streets and market-places; laid out roads, and conferred such benefits on the Cephalones that his memory is still green among them, and he is affectionately called "the Father." But his imperious nature, which would submit to no interference, embroiled him with the home authorities, and in 1830 he was compelled to resign his post. In 1838 his services were recognized officially by his elevation to a knight-companionship of the Bath; and in the following year he was appointed to the command of the northern district of England, where an insurrection was apprehended among the Chartists, but he completely cowed the disaffected by the skill and vigour of his military dispositions.

The ability he had displayed in this critical duty, and his well-known energy, marked him out for employment in India; and after a twelvemonth's service at Bombay, where he inaugurated that system of military reform which afterwards made him so famous, he was directed, in August, 1842, to assume the command of the provinces of Upper and Lower Scinde. The aspect of affairs was lowering. The Ameers, long disaffected to our rule, had been encouraged by the recent disasters to our arms in Afghanistan, and were rapidly preparing for hostilities while professing submission. Napier, believing that war was inevitable, determined on striking the first blow. One of his first military achievements in the campaign was the capture and destruction of the strong fort known as the Emaun-Ghur, a feat described by Wellington as one of the most remarkable he had ever known to be performed or had ever read of.

On the 17th of February, 1843, with only 1800 infantry and 800 cavalry, he encountered the Beloochees near Meeanee, and after a desperate struggle completely defeated them. The Ameers were 35,000 strong; but British steadiness, and Napier's generalship, prevailed over the inequality of numbers, and over their fiery valour. They were driven from the field with a loss of 6000 men. The killed and wounded of the British forces amounted to 270. Hyderabad now surrendered, and six of the Ameers made submission; but Shere Mohamund, surnamed *the Lion*, still held out. Napier gave him battle at Dubba on the 24th of March—5000 men against 25,000—and completely crushed him. Scinde was formally annexed to the British empire, and Sir Charles appointed governor with despotic powers. He proved to be as great an administrator as he had been a soldier, and his rule was marked by a vast improvement in the condition of the province.

Broken by age, climate, sickness, and toil, he returned to England in 1847, and was received with a welcome worthy of his unparalleled services. But he enjoyed a very brief repose. In 1848 the war of the Punjab broke out, and assumed an aspect of such perilous import that the public mind became greatly alarmed, and demanded that the conqueror of Scinde should be sent to save the British Empire. He set out from England in March, 1849, but on reaching India in May found the struggle was over.

For two years, however, he remained in the country carrying out some much-needed military reforms, correcting abuses, and endeavouring to infuse a fresh spirit into the Indian army. Unfortunately he came into collision with Lord Dalhousie, the governor-general, and resigning his command, returned to England in March, 1851. His career was at an end. Worn with incessant activity, mental and physical, he passed the remainder of his life in dignified retirement, and died on the 29th of August, 1853, having just completed his seventy-first year. The annals of the British army contain many illustrious names, but few are more deserving of being held in honour by Englishmen than that of the conqueror of Scinde.

**NAPIER, SIR WILLIAM FRANCIS PATRICK**, a gallant soldier and able historian, was the younger brother of the preceding, and born in 1785 at Castletown, near Colbridge, in the county of Kildare. In his fifteenth year he entered the army as an ensign, and in 1804 attained the rank of captain. His conduct at the siege of Copenhagen, and the battle of Kioje in 1807, showed that he was made of the true Napier stuff. In 1808-9 he served under Sir John Moore, and fought at the battle of Coruña. He was actively engaged in the whole Peninsular War from 1809 to 1811, led the 43rd Regiment with brilliant valour, was four times severely wounded, and received seven decorations for the battles of Busaco, Salamanca, Fuentes d'Onore, the Nivelle, the Nive, and Orthes.

In 1811 he was promoted to a majority, became lieutenant-colonel in November, 1813; colonel in July, 1830; and attained the rank of major-general in November, 1841. In the following year he was appointed lieutenant-governor of Jersey, an office which he held until 1848, when he was created a knight-companion of the Bath. But the work by which he will be best known to posterity is his "History of the War in the Peninsula and in the South of France, from the year 1807 to the year 1814." On this *magnum opus*, which is one of the finest military histories of the world, he bestowed the labour of eighteen years. Its impartiality has been acknowledged by foreign critics; its explanations of strategical operations are remarkable for their lucidity; the style is grave and eloquent; and the battle-scenes are painted in the liveliest colours. Sir William was also the author of some political treatises, reviews, a "History of the Conquest of Scinde" (1845); the "History of the Administration of Scinde" (1851); and a biography of his illustrious brother (1857). He died 12th February, 1860, aged seventy-five.

**NAPIER, JOHN**, of Merchistoun, was born at Merchistoun Castle, near Edinburgh, in the year 1550. His name has been variously written. Besides the Latinized forms Neper and Neperus, we meet with Naper, Napier, and Nepair. From the date of Napier's matriculation into the University of St. Andrew's in the year 1562-63, to the publication of his fainful "Plain Discovery of the Revelation of St. John" in 1593, scarcely anything is known concerning him. In 1593 he was chosen by the General Assembly one of the commissioners appointed to counteract the attempts of the Roman Catholics against Protestantism, then recently established. In the year 1594 he was first known to be occupied with the discovery of a method which should supersede the long and laborious arithmetical operations which the solution of the most simple trigonometrical problems then exacted. This resulted in the famous invention of logarithms.

Napier's Tables were published in 1614. The principle of their construction Napier at first withheld, "waiting the judgment and censure of mathematicians before exposing the remainder to the malignity of the envious." This explanation was given in a posthumous work, edited by his third son Robert, and published in 1619. From the date of the publication of the *Logarithmic Canon* until the death of Napier, which took place the following year, there

is little recorded of him that demands particular notice, except his connection with Briggs. [See LOGARITHMS.] His "Rabdologie, seu Numerationis per Virgulas, libri duo" (Edinburgh, 1617, 12mo.), was the last of his literary productions.

Napier died at Merchistoun on the 3rd or 4th of April, 1617, *o.s.*, and was interred in the cathedral church of St. Giles at Edinburgh. He was twice married. Of his improvements in trigonometry it is sufficient to mention the elegant theorems known as Napier's "Analogies," and his theorem of the "five circular parts," which furnishes a ready solution of all the cases of right-angled spherical triangles.

**NAPIER'S BONES, or RODS,** were a contrivance of John Napier to facilitate the performance of multiplication and division, explained by him in his "Rabdologie," published in 1617. The invention would have been perhaps more employed, but for his discovery of logarithms. The "bones" are slips of ivory 3 inches long and a little over a quarter of an inch wide.

**NAPLES.** The former kingdom of Naples, which is now divided into several provinces, embraced a small part of the centre and the whole of the south of the Italian peninsula. The region includes the highest points and wildest scenery of the Apennines, and further possesses a fine climate and a soil overflowing almost spontaneously with the choicest productions for the use of man. But the mass of the people, more especially in the towns, are wretched objects to observers from northerly latitudes, ill-clad and ill-housed, partly owing to long administration under an absolute government, and partly to their own indolence. With little labour a supply of vegetable and farinaceous food is secured, olives, wine, Indian corn, legumes, and fruit, to which small fish found in shoals along the shores is readily added. Fuel is not needed, except for preparing meals, where the sun furnishes the requisite warmth for personal comfort; the same cause offers an excuse for indifference to clothing and house accommodation; and thus the very bounty of nature is turned into a curse by a population indisposed to industry, to whom it is the height of enjoyment to lounge and gossip in the thoroughfares, bask in the sunbeams, or slumber in the shade. The provinces contain many sites of great scenic beauty and classical interest, unique remains of ancient civilization, found in the cities which have been exhumed from the load of volcanic ashes under which they were buried for centuries, Herculaneum and Pompeii. With Sicily, the south-western portions form the earthquake region of Italy, visited by shocks of tremendous violence in the last century, commencing in 1783, when chasms were opened in the ground, streams were diverted into fresh channels, and all buildings near the focus of disturbance were levelled, to the destruction of thousands of lives. The inhabitants of the countries composing the former kingdom of Naples are derived from various and mixed races. The descendants of the ancient Samnites, Peligni, Marsi, Frentani, Lucanians, and other people of old Italian origin, the Etruscan Campanians, the wild Brutii, and the Greek population of the coast, combined with Romans and Latins to form the present Neapolitans. The Longobards, the Normans, the Spaniards, and other foreign nations, have aided in the formation of the national character.

The district was conquered by the Romans in the third century *b.c.* After the fall of the Western Empire it was occupied by Ostrogoths and Lombards, then by Romans from the Eastern Empire, who in their turn were constantly harassed by Arabian bands which attacked them by sea, and who finally succumbed in the eleventh century to the Norman settlers. The Hohenstaufen family next held the country from 1194 to 1254. In 1265 Charles of Anjou gained possession of Naples and established his dominion,

which was secured by the cruel execution in 1268 of Conradin, the lawful heir. His power, however, having been impaired by the Sicilian Vespers, 30th May, 1282, rapidly declined in consequence of the crimes and degeneracy of the royal family, and of disastrous wars with the island of Sicily, then in possession of the Aragonese. Charles VIII. of France, as heir of the Anjou family, undertook a campaign against Naples and gained possession of the kingdom in a few days, but was unable to retain it. His successor Louis XII. allied himself with Ferdinand the Catholic of Spain with a view to conquer Naples, but in consequence of dissensions was compelled to abandon his enterprise after the victory of Gonsalvo da Cordova on the Liris. Naples, like Sicily and Sardinia, then yielded to the power of Spain, which maintained her dominion till 1713, the chief event of this period being the rising of Masaniello. After falling under the house of Hapsburg it reverted to the house of Bourbon in 1734, and it remained under their rule for the rest of the century. In 1806 Napoleon created his brother Joseph king of Naples, who was succeeded in 1808 by his brother-in-law Murat. In June, 1815, King Ferdinand, who with the aid of the English had meanwhile maintained his ground in Sicily, returned to Naples, and in his person the Bourbon dynasty was restored. In May, 1860, Garibaldi began his victorious march through Sicily and Calabria, which ended at Naples in August. In the meantime the Piedmontese troops, at the instigation of Cavour, had also entered the kingdom of Naples. On 1st October, Francis II. was defeated in a skirmish on the Volturno. On 7th October, Victor Emmanuel and Garibaldi entered Naples side by side amid the greatest popular enthusiasm. Francis was then besieged at Gaeta, and at length compelled to surrender and retire to Rome.

**NAPLES, PROVINCE OF,** is the name of the metropolitan province of the old kingdom of the Two Sicilies, which includes the capital and the territory round the bay from Cape Misenum and Cuma on the west to Castellamare and Sorrento on the south-east. The islands of Ischia and Procida belong also to the province of Naples. The province is divided into four districts—(1) Naples; (2) Pozzuoli, which includes the whole western division and the islands; (3) Castellamare, which comprises the territory at the base of Mount Vesuvius, and the coast opposite Naples as far as Sorrento; Casoria, which comprehends a tract of the Campanian plain stretching north of the range of hills behind the city of Naples. The population of the province in 1882 was 992,398.

**NAPLES** (*Napoli*, in Italian), a city of Italy, formerly capital of the kingdom of the Two Sicilies, is situated on the northern coast of the fine bay of the same name, and partly at the foot and partly on the slope of a range of hills. The south-east side of the bay is formed by Monte Sant' Angelo, a spur of the Apennines, 5000 feet in height, which is connected with the island of Capri by a reef of rock. At its base lie the villages of Massa Lubrese, Sorrento, Vico Equense, and Castellamare, near the ancient Stabia, which was overwhelmed by an eruption. The other sides of the bay are bounded by the Campanian plain, the surface of which has undergone numerous changes in consequence of volcanic agency. In the middle of the plain between the chain of Sant' Angelo and the hilly district north of Naples rises Mount Vesuvius, dividing it into two distinct districts, the southern of which is intersected by the river Sarno, and the northern by the Sebeto. The plain, as well as the slopes of Vesuvius itself, is luxuriantly fertile and one of the most densely peopled districts in the world. Naples, which stretches east towards the plain, nearly to the Sebeto, is to a great extent situated on a slight volcanic eminence. This tract is identical with the Campi Phlegrei, so frequently mentioned by the ancients, which extended from Naples to Cumæ. In the

direction of Castellamare and beyond the Sarno are situated the ruins of Pompeii, and there are numerous villages on the site of the ruined Herculaneum.

Seen from the sea Naples appears in the form of two crescents, of very unequal depth, one on the east and the other on the west, divided by the point of Castel dell' Ovo and the hill of Pizzofalcone, which is behind it. The eastern crescent, which includes the great bulk of the city, faces the south-east, and is bounded by the hill of Capodimonte to the north, and that of Sant' Elmo or Ermo to the west, crowned by the castle of that name, which commands the town. Between these two hills is a considerable depression, on which the suburbs of La Sanità and L'Infrascata are built. The slope of the hill of Capodimonte is likewise covered with houses, forming the suburbs called Miracoli and Le Vergini. To the eastward the town is open to the plain of Campania. From the barrier of Capo di Chino, at the entrance from Rome, a succession of fine streets traverses the body of the town to the sea, the principal of which, the Via di Roma, about a mile in length, runs due south, and divides the old city, which is east of it, from the new districts. The Via di Roma terminates in the Plaza before the royal palace, and the final portion of it is famous by the older name of the "Toledo." The old city forms a square of about a mile on each side. Part of its walls, towers, and ditches still remain, and several of the gates are standing. This part of the town, which is in a plain, has narrow streets and lofty massive houses, many of them six or seven storeys high; it is very thickly inhabited. West of the Via di Roma numerous streets run up the hill of Sant' Elmo. South of the hill of Sant' Elmo, and between it and the point of Pizzofalcone, is another depression, which affords a carriage communication between the Roma and the western crescent, or new part of the town, which is called by the general name of Chiaja (the quay). This part, which is much contracted between the hills and the sea, extends in length about a mile and a half between the hill of Pizzofalcone to the east and that of Posilipo to the west. (Lucullus lived on the Pizzofalcone; Virgil did much of his best work at Posilipo.) There are two fine roads to Pozzuoli, and some fine mansions have recently been erected in this part of Naples.

Most of the new buildings at Naples are in a good architectural style, but many of the older ones are either overloaded with ornaments or disproportionate in their parts. The most remarkable are—(1) The royal palace, "La Reggia," a large mass of buildings, 400 feet in length, with three orders of pillars, one above the other, Doric, Ionic, and Corinthian. The palace contains a number of fine pictures, the royal printing-press, and the royal porcelain manufactory. In 1885 plans were made for its exterior embellishment. Near the palace are the arsenal, the cannon foundry, the wet dock, the Castel Nuovo, and the grand opera house. (2) The palace, museum, and library, called "Degli Studi," are in the northern part of the town, at the foot of the hill of Capodimonte; this museum (the Museo Nazionale) is one of the richest in Europe in sculptures; and the library contains a fine collection of works. (3) The churches and chapels of Naples amount to more than 300; but in general they are remarkable for their monuments, paintings, and other accessories, rather than for their architecture. The cathedral, begun by Masuccio, a Neapolitan architect and sculptor of the thirteenth century, has been since repeatedly altered, ornamented, and spoiled. The interior is rich in ancient columns of valuable marbles; it also contains a splendid mausoleum of Charles I. of Anjou, the conqueror of Naples. The adjoining chapel of San Gennaro is rich in paintings. The remaining churches contain many valuable paintings and sculptures. (4) The royal palace of Capodimonte is a heavy structure, but is remarkable for its fine situation, the excellent road leading to it, con-

structed by the French, its extensive park and hunting grounds, and the adjoining observatory. On the slope of the hill is the Chinese College, for the education of young Chinese, who, after taking holy orders, return to their country as missionaries. On another part of the hill of Capodimonte is the botanical garden.

Naples has many charitable institutions, such as the great hospital Degli Incurabili; the founding hospital; the school for the deaf and dumb; the asylum for the blind; the Reclinatorio, or general workhouse for able-bodied poor, with a school annexed to it, and which contains about 3000 poor; San Gennaro dei Poveri, for the poor who are unable to work; San Francesco di Sales, and several other minor hospitals and houses of refuge. There are a large and increasing number of public schools, a medical college, a veterinary college, two military schools, a college of pilots, a most interesting aquarium, and a conservatorio, or school of music. The museum contains an immense collection of antiquities, sculptures, frescoes, mosaics, bronzes, &c., and the famous objects found at Herculaneum and Pompeii. The university, occupying the old college of the Jesuits, has a valuable library. There are four public libraries, and several theatres, among which the Opera San Carlo is one of the largest in Italy. The streets used to be infested with mendicants of both sexes, but this nuisance is largely abated. There are sixty charitable institutions, comprising hospitals for the sick (sometimes with 2000 patients), blind, poor, orphans, and for the British and Americans.

The manufactures are gloves, soap, perfumery, silks, artificial flowers, corals, earthenware, hats, and carriages. There are type-foundries, and iron and glass works. The imports are manufactured goods and colonial produce. Naples is the first maritime city of South Italy, and has several ports—the Porto Piccolo is now used for boats only; the Porto Grande is for passenger and mercantile steam vessels; another port was opened in 1864, and in 1869 one was constructed in the island of Procida, in the Bay of Naples. The Porto Militare is a modern harbour, exclusively for ships of the navy. The most remarkable of the palaces of the nobility are the Palazzo Gravina or Orsini, Palazzo Maddaloni, that of San Severo, that of Della Rocca, those of Franeavilla, Stigliano, Berio, &c. Naples was formerly not so well supplied with water as Rome, and has not such handsome fountains. Works, however, were opened in 1885 for giving an ample supply by conducting to Naples, from a distance of about 20 miles, the spring waters of the basin of Serano, which are of the greatest purity. The neighbourhood abounds in delightful walks. Snow for cooling drinks and for ices is brought from the mountain of Castellamare, where it is kept in large reservoirs. The population of the city of Naples in 1882 was 494,314, it being thus by far the largest city in Italy.

Naples, or Neápolis, that is, "new city," was a Greek colony from Cumæ. The date of its origin is not known. It received colonists from Chalkis, Pithékoussa, and Athens; and subsequently admitted some Campanians also among the body of citizens. It became allied to the Samnites, but after their subjugation by Rome maintained its independence as a republic, and during the second Punic War sent ambassadors to Rome to propose an alliance against Hannibal. It continued afterwards in alliance with Rome and became a municipium. After the fall of the empire it was taken by the Goths, retaken by Belisarius, and lastly destroyed by Totila, in 548. It was afterwards rebuilt, and governed successively by the Longobards, the native dukes, and the Normans. Naples was one of the last towns which submitted to the Normans; it acknowledged King Roger I. of Sicily as its sovereign about 1187.

**NAPLES YELLOW**, the name of a pigment used in oil painting and enamelling, and formerly manufactured at Naples. It is a basic antimoniate of lead.

**NAPOLEON I.**, Emperor of the French, was of Corsican birth. His name was *Napoleone Buonaparte*, but while yet a young man, certainly by 1796, he dropped the foreign *u* in his surname, and had long before Frenchified his Christian name. He never used the aristocratic "de."

Napoleon, according to the received date, expressly corroborated by his brother Joseph, was born on 15th August, 1769. But in a man so phenomenally mendacious nothing must be taken for granted. Our suspicions are intensified when we learn from registers and papers that Madame Buonaparte gave birth to a son christened *Nabulione* on 7th January, 1768. If we consider that in 1779, when application was made for entry into the free military school of Brienne, Napoleon (if he were "*Nabulione*") would have been over the statutory age of ten, and therefore inadmissible, we get at once a grave reason for misstatement on the subject. Joseph, probably the second son, and born in 1769, would then be put down as the elder by exchange of birth dates. The published date of birth being 15th August, 1769, and Joseph being always acknowledged as the elder brother, we may take these statements in the present article to avoid constant correction.

Napoleon was then, by the received version, the second son of Carlo Maria de Buonaparte (born 1746) and Letizia Ramolino (born 1750), both natives of Corsica. The family of de Buonaparte was by origin Tuscan and not Corsican, but had been settled in the island from about 1540. It was on the Golden Book (of nobility) of Genoa, and had received letters of nobility from the Grand-duke of Tuscany in 1740.

Before the birth of Napoleon, his father had served under Paoli in the defence of Corsica against the French, to whom the Genoese had sold the island. The entire submission of Corsica to France took place in June, 1769, about a month before the accepted date of Napoleon's birth, who, therefore, legally speaking, was born a subject of France. In the following September, when Count Marbois, the French commissioner, convoked the States of Corsica, consisting of three orders, nobility, clergy, and commons, the family of Buonaparte, having shown their titles, were registered among the French nobility; and Carlo some years afterwards repaired to Paris as member of a deputation of his order to Louis XVI. He was soon afterwards appointed judicial assessor of Ajaccio. He was then in straitened circumstances, and through Count Marbois's interest he obtained the free admission of his son Napoleon to the military school of Brienne as a king's pensioner.

Napoleon left Corsica for Brienne when he was, by supposition, in his tenth year, in April, 1779. At Brienne, where he spent five years and a half, he made great progress in mathematics, but showed less disposition for literature and the study of languages. There was nothing extraordinary in young Napoleon's school life; he was a clever, steady, studious boy, and nothing more. At this school he became acquainted with young de Bourrienne, who was later on to be his faithful friend, and in the time of power his secretary, and whose memoirs are therefore of priceless importance. De Bourrienne won the passionate young Corsican's love by being the only one who did not mock his Italian dialect, his queer name, his poor island home.

Napoleon left Brienne 17th October, 1784, for the Military School at Paris, there to continue his course of studies till he had attained the age required for entering the army. His leaving certificate is extremely curious. The following are some of its phrases:—"M. de Buonaparte (*Napoléon*), born 15th August, 1769, 4 feet 10 inches 10 lines in height (that is in old French feet, equal to 5 feet 4 inches of our measure), has finished his fourth form; health, excellent; character, obedient; conduct, very regular; has always distinguished himself by his application to mathematics. He will make an *excellent sailor*, and deserves admission to the *École Militaire* at Paris."

The "excellent sailor" left the *École Militaire* after about a year's study, in September, 1785, and received his commission as sub-lieutenant in the regiment of artillery de la Fère, and was soon afterwards promoted to a first lieutenancy in the artillery regiment of Grenoble, stationed at Valence. His father had just previously died at Montpellier of cancer in the stomach. An old great-uncle, the Archdeacon Lucien of Ajaccio, now acted as father to the family; he was rich, and Carlo had left his children poor. Napoleon's elder brother Joseph, after receiving his education at the College of Autun in Burgundy, returned to Corsica, where his mother, sisters, and younger brother resided. Napoleon, while at Valence with his regiment, was allowed 1200 francs yearly from his family (probably from the archdeacon), which, added to his pay, enabled him to live comfortably and to go into good society. While at Valence, he wrote a dissertation in answer to Raynal's question, "What are the principles and institutions by which mankind may obtain the greatest happiness?" The Academy of Lyons adjudged him the prize.

When the Revolution first broke out he was at Valence with his regiment. He deserted his post, and procured, by very unscrupulous means, his election as lieutenant-colonel of volunteers in Ajaccio; at the Easter festival he attempted to seize the town, but was repulsed, and then fled to France. It would appear that he had desiged upon Corsica at this time, and not France. His desertion was forgiven, and in October, 1792, he became a captain in the regiment of Grenoble artillery. He was at Paris in 1792, wretchedly poor, in company with his faithful Bourrienne, himself scarcely less miserable, trying to earn a pittance by speculation in houses and lands in a small way. The pair often went hungry. One day, seeing a large excited mob, they followed them, and witnessed the attack on the Tuileries, on the 20th of June, 1792. "*Che coglione!*" cried Napoleon (who always used Italian expletives when excited), as he saw the poor king led forth to the palace windows with a red cap of liberty stuck on his head to appease the mob. Then, with that contempt of the "*cannaille*," that cool judgment of what was the right thing to do, and that disregard of human life which always distinguished his career, he proceeded—"How could they allow those despicable wretches to enter the palace? Why, a few discharges of grape-shot among them would have made them all take to their heels; they would be running yet at this moment!" He witnessed also the scenes of the 10th of August, and soon after he left Paris to return to his family in Corsica. General Paoli then held the chief authority in that island, and Napoleon served him in an unsuccessful attack upon Sardinia. As the horrors of the Revolution began to declare themselves Paoli called upon his countrymen to shake off the French yoke. The English fleet appeared on the coast, and the French were obliged to quit the island. Napoleon, who had taken the French side, left about May, 1793, and his mother and sisters with him, as also the Abbé Fesch (the immensely wealthy Cardinal Fesch of the consulate and the empire), a half-brother of Madame Buonaparte *mère*. After seeing them safe to Marseilles, Napoleon went to join the 4th regiment of artillery, which was stationed at Nice with the army intended to act against Italy.

Napoleon was at Paris in September, 1793. Being known as a good artillery officer, he was sent to join the besieging army before Toulon, with the rank of lieutenant-colonel of artillery. Napoleon constructed his batteries with great skill, and the works which commanded the harbour were carried by the French, after a sharp resistance from the English, in which the British commander, General O'Hara, was taken prisoner, and Bonaparte received a bayonet wound. Upon this the evacuation of the place was resolved upon by the allies. In consequence of his services at the taking of Toulon, Bonaparte was raised by General Dugommier to the rank of brigadier-general of artillery, in

February, 1794, with the chief command of that department of the Army of the South. He then joined the army under General Dumorbron, which was stationed at the foot of the Maritime Alps, and so made the campaign of 1794 against the Piedmontese troops.

On the 13th July, 1794, the deputies of the Convention sent Bonaparte to examine the fortifications of Genoa, and to observe the conduct of the Genoese government. These instructions were dated Loana, and signed Ricord. Ricord and the younger Robespierre were then commissioners. Meantime the revolution of the 9th and 10th Thermidor (27th and 28th July) took place, when Robespierre fell, and his party was proscribed. On Bonaparte's return from Genoa to headquarters he was placed under arrest as a Robespierriist, but was released in a fortnight. His coolness under examination and his good service with the colours saved his life; but the officers appointed under Jacobin auspices were in ill-favour under the counter-revolution, and Bonaparte was dismissed from the Italian army and transferred to that of La Vendée, engaged in suppressing a royalist rising. He was also degraded to the rank of simple brigadier. He left the army in hot haste, hurried to Paris, flatly refused the reduction in rank, and declined to go to La Vendée, except as general in command of the artillery. In consequence he was *dismissed from the army*, a fact not until recently at all generally known. The date of his dismissal was 15th September, 1794, and it was an act of the Committee of Public Safety. "You are too young to command in chief," said Aubry to him. "We age quickly on the battlefield, citizen," was the cool reply, "and I have just come from there."

Now thrown on his own resources, at the age of 25, living and starving with Bourrienne as before, pawning books or clothes for a dinner, with his frantic ambition gnawing at his heart far worse than any hunger, Bonaparte turned his thoughts to the East. He offered to the government (August, 1795) to lead 2500 artillerymen to Turkey, there to train up an effective force and construct ample defences, so as to form a bulwark against the growing power of Russia. His memorial, complete in every detail, even to suggesting the names of the officers, is still existent. If this amazing proposition had been granted France might have bidden Bonaparte farewell. Once established in Turkey, he would have started from thence on that career of eastern conquest which would have made him a new Alexander, and was the dream of his life.

On the 5th October, 1795, the very position repeated itself which Bonaparte and Bourrienne had seen three years before; the mob rose in blind revolt, Sansculottism was giving its last kick. General Menou, sent against them, was caught in the Rue Vivienne and had to make terms with the mob to get free. Carlyle has given a magnificent description of the scene:—"Some call for Barras to be made commandant. Some, what is more to the purpose, bethink them of the Citizen Bonaparte, unemployed artillery officer, who took Toulon. Barras is named Commandant-à-cloak; this young artillery-officer is named Commandant. And now, a man of head being at the centre of it, the whole matter gets vital. . . . And roar and thunder go all his great guns, blow to air some 200 men, mainly about the Church of St. Roch."

Bonaparte had saved the republic. The Directory, which now came into being as the supreme executive power, appointed him General of the Interior, and in February, 1796, the Directory having determined to "free Italy," Bonaparte was appointed to command the expedition. A pretty boy had come to him to beg for his father's sword, a certain Viscount de Beauharnais (or, as we now write it, Beauharnais), who had perished on the scaffold in the Terror. The general thus became acquainted with the mother of the little lad, a fascinating Creole, Joséphine, or rather, more exactly, Marie Rose Joseph Tascher de La

Pagerie, widow of the Viscount de Beauharnais. She was at this time very lovely, and had managed to get into as good society as the wretched times afforded, though there had been periods of her life, not many months remote, when her elegance was her only resource. Barras, her chief protector, was generous, and gave her to Bonaparte. Very curiously both the parties when it came rapidly to the point of marriage, falsely stated their ages, the young general calling himself twenty-eight, thus adding a year to the truth (or was it indeed the truth for once, and did he thus admit the old Brienne fraud as to his birth?), and the widow setting herself down as twenty-nine, when she was in reality thirty-three. The marriage was on 9th March, 1796, and Bonaparte left almost at once for the front. The army mustered about 50,000 men, but barely more than two-thirds were fit for the field. Against him was the veteran Beaulieu, with a picked Austrian force and the whole strength of Piedmont. The combined armies were posted along the ridge of the Apennines, at the foot of which the French were advancing. Bonaparte, in his despatches to the Directory, stated the allied armies at 75,000 men, and his own effective troops at 35,000. His proclamation on taking command is as shameless a thing as was ever penned, but its effect was electric. "Soldiers, you are half-clothed and half-fed, follow me to the most fruitful country in the world. There you shall find honour, fame, and money, and each man shall have six acres of land," &c. He avowedly led an army of plunderers. On the 27th of March he arrived at Nice, and after some manœuvring and skirmishing succeeded in winning the battle of Dego (more properly of Magliana), the last of a series of combats which opened the road into the plains of North Italy, whereupon Beaulieu retired to the Po. The Sardinians were soon forced to sign with Bonaparte the convention of Cherasco (28th April, 1796), by which the other Piedmontese fortresses, and all the passes of the Alps, were surrendered to the French.

Being now safe with regard to Piedmont, Bonaparte advanced to encounter Beaulieu, who had posted himself on the left bank of the Po, opposite to Valencia, his troops extending eastward as far as Pavia. Bonaparte crossed the Po at Piacenza (7th May), and at once attacked the bridge of Lodi, over the Adda, which the Austrians defended with a numerous artillery (10th May). He carried it through the daring bravery of his grenadiers and the bad dispositions of the Austrian commander, who had not placed his infantry near enough to support his guns. The Austrian army was panic-struck. Beaulieu had only time to throw a garrison into Mantua, and then withdraw into Tyrol. Bonaparte took possession of Milan (15th May), and of all Lombardy, with the exception of Mantua, which he blockaded. Thus ended the first Italian campaign of 1796. The excesses of the French army, plundering right and left those whom they had come to liberate, led to insurrections, in which French soldiers were killed by the peasantry. On the 23rd of May, Pavia was in open insurrection. Bonaparte, after taking the city, deliberately ordered it to be given up to plunder for twenty-four hours. He then levied enormous contributions, on the Dukes, of Parma, Modena, and Tuscany, and the Pope. The Directory wanted money, and Bonaparte says that he sent, during the first Italian campaign, 50,000,000 francs from Italy to Paris, besides a great number of the best pictures and other works of art.

Marshal Würmser, a veteran Austrian general, was now detached with 30,000 men from the Austrian army of the Rhine, and marched into Tyrol, where he collected the remains of Beaulieu's troops and the Tyrolese levies, forming altogether an army of between 50,000 and 60,000 men. Würmser was beaten at Castiglione, and again at Bassano, and threw himself into Mantua, with the wreck of his army, reduced to less than 16,000 men (15th September).

A third general and a third army were sent by Austria into Italy in the autumn of the same year. Marshal Alvinzi advanced from Carinthia by the way of Belluno with 80,000 men, while General Davidowich, with 20,000, descended from Tyrol by the valley of the Adige. After several conflicts, in which they were on the whole successful, and by which Bonaparte was placed in a critical position, Bonaparte attacked them and won the battle of Asolo on the 15th of November, 1796, and two following days, the hardest fought battle of any in the Italian campaigns. Alvinzi was compelled to retire to Vicenza and Bassano, and thus ended the third campaign of 1796.

Bonaparte now allowed Modena, Reggio, Bologna, and Ferrara to form themselves into a republic, which was called Cispadana. He had repaired to Bologna in January, 1797, to threaten the Roman states, when he heard that Alvinzi, with 50,000 men, was moving down from Tyrol along the right bank of the Adige upon Rivoli, where Joubert was posted. On the 13th of January Bonaparte hurried from Verona with Massena's division to Rivoli, and on the 14th won the battle of Rivoli. Another Austrian division under General Provera had meantime forced the passage of the Adige near Legnano, and arrived outside of Mantua, when Provera attacked the entrenchments of the besiegers, while Würmsen made a sortie with part of the garrison. Bonaparte arrived just in time to prevent the junction of Provera and Würmsen. Soon afterwards, the garrison having exhausted their last supply of horseflesh, and being much reduced by disease, Würmsen offered to capitulate. Bonaparte granted him honourable conditions, and behaved to the old marshal with the consideration due to his age and bravery.

Bonaparte was now secure from the Austrians in the north, and turned anew against the Pope, who had refused the heavy terms imposed upon him by the Directory, and after paying 5,000,000 livres, had refused to remit further. Bonaparte occupied Ancona and the Marches almost without resistance, and advanced to Tolentino, where he received deputies from Pius IV., who sued for peace. The conditions dictated were 15,000,000 more livres, part in cash, part in diamonds, within one month, and as many again within two months, besides horses, cattle, &c., the cession of Bologna, Ferrara, the Romagna, and Avignon (the papal city in France), and the possession of the town of Ancona till the general peace, together with an additional number of paintings, statues, and MSS. On these terms the Pope was allowed to remain at Rome a little longer. The Directory wished to remove him altogether, but Bonaparte disregarded, as usual, anything but his own policy. He calculated, in his cynical way, the importance of religious influence over nations, and treated the Pope's legate with a courtesy most repugnant to his freethinking comrades. The foundations of the future *Concordat* were laid.

Austria had meantime assembled a new army on the frontiers of Italy under the Archduke Charles. Bonaparte attacked the archduke on the river Tagliamento, the pass of which he forced (16th March). The archduke made a stout resistance at Tarvis, where he fought in person, but was at last obliged to retire. Bonaparte continued to advance towards Vienna without any regular engagement till at Judenburg in Upper Styria, about eight days' march from Vienna, his oft-repeated offers of peace took effect; and Generals Bellegarde and Meerfeldt arrived from Vienna to arrange preliminaries, which were signed at Leoben by Bonaparte, 18th April, 1797. Of the conditions of this convention some articles only were made known at the time. The secret articles were, that Austria should have a compensation for the above losses out of the territory of the republic of Venice. Bonaparte had prepared for this, though France was nominally not only at peace, but actually in alliance with Venice. To cause a rupture he had seized upon the castles of Bergamo, Brescia, Verona, and other

fortified places of the Venetian states; he made the country support his army, and he favoured the disaffected against the senate. At last, as Bonaparte had planned, an insurrection broke out in Verona, April, 1797, whereupon he insisted upon a total change in the Venetian government, and French troops being surreptitiously introduced into Venice, the Doge and all authorities resigned. A provisional government was formed, but Bonaparte had already betrayed Venice to Austria. By the definitive treaty of peace signed at Campo Formido, near Udine, usually called Campo Formio, 17th October, 1797, the Emperor of Austria ceded to France the Netherlands and the left bank of the Rhine, with the city of Mainz; he acknowledged the independence of the Milanese and Mantuan states under the name of the Cisalpine Republic; and he consented that the French Republic should have the Ionian Islands and the Venetian possessions in Albania. The French Republic, on its part, *consented* (such was the word) that the emperor should have Venice and its territory as far as the Adige, with Istria and Dalmatia. The provinces between the Adige and the Adda were to be incorporated with the Cisalpine Republic. The emperor was also to have an increase of territory at the expense of the Elector of Bavaria, and the Duke of Modena was to have the Brisgau. This treaty was effected by the young general, still only twenty-eight, entirely on his own responsibility, and even against the express orders of the Directory. In fact, he acted throughout just as a sovereign prince. His court at Montebello, near Milan, had every sign of royalty throughout the summer, and Josephine throned it like a very queen beside him. And yet this man had at that time commanded an army in chief for scarcely more than a twelvemonth.

During the several months that the negotiations for the peace lasted, Bonaparte had time to effect other changes in Italy. He began with Genoa. After encouraging a sedition against the senate, a sum of 4,000,000 livres was exacted from the principal nobles; the French made a military occupation of the country, and placed a garrison within Genoa; and a constitution was modelled upon that then existing in France, with councils of elders and juniors, a Directory, &c. Bonaparte next consolidated the Cisalpine Republic, and gave it a constitution after the model of France. The installation of the new authorities took place at Milan on the 9th of July with great solemnity. Bonaparte appointed the members of the legislative committees, of the Directory, the ministers, the magistrates, &c. Tuscany, Parma, Rome, and Naples remained under their old princes—all, however, with the exception of Naples, in complete subjection to France.

After the treaty of Campo Formio, Bonaparte was appointed minister-plenipotentiary of the French Republic at the congress of Rastatt for the settlement of the questions concerning the German Empire. He now took leave of Italy and of his fine army, which had become enthusiastically attached to him. There is no evidence of his having shown himself personally fond of money; he had exacted millions, but it was chiefly to satisfy the cravings of the Directory, and partly to support his army and to reward his friends. He once blanded Marmont as a fool for sending on money to Paris which was intrusted to him.

Napoleon did not stop long at Rastatt, but proceeded to Paris, where he arrived in December, 1797. He was received with the greatest honour by the Directory. He had written from the Army of Italy to the Directory, "The time is at hand when to destroy England we shall have to seize upon Egypt." With the eagle eye of genius he had perceived that the occupation of Egypt would break up the English power in India. England's enormous strides in the East set him aflame with envy. The land of romance, of barbaric splendour (and what mattered it to a Bonaparte that this splendour



of a few rested upon the grinding poverty of countless thousands), the ready acquiescence to despotism, and the absence of that inconvenient love of freedom so tiresome in the West, all beckoned this born tyrant and despot Eastwards.

If Bonaparte was eager to rival Alexander the Great, the Directory were no less eager, at any cost, to get out of France a personage who, as it were, with one wave of the hand could by his unbounded popularity backed by his consummate generalship send them all packing at a moment's notice. Bonaparte kept very quiet, but he saw and made friends with every man of importance, and the overthrow of the feeble Directory was often discussed. As he said to his private friends, "The pear is not ripe, I must wait." To mask the design which was agreed upon between the general and his servile masters, a great armament was prepared nominally against England, and Bonaparte was appointed general-in-chief of the "Army of England;" but, after a rapid inspection of the French coasts and of the troops stationed near them, he returned to Paris. The money for the expedition to Egypt was procured from the unhappy Switzerland, where, upon the most absurdly flimsy of pretexts, a quarrel was sought, and no less than £1,600,000 sterling was extorted for its indemnity. Rome was also plundered in the same way by Berthier; every penny was sent to Bonaparte, and the French troops engaged in the plunder were kept so miserably that they actually revolted. Bonaparte now repaired to Toulon, whence he sailed on board the admiral's ship *L'Orient* on the night of the 19th May, 1798, while Nelson's blockading fleet had been forced by violent winds to remove from that coast. The land force consisted of 25,000 men, chiefly from the Army of Italy. The fleet arrived before Malta on the 9th of June. With his usual boldness he summoned the Grand Master to surrender on the 11th, and the Grand Master obeyed the summons. After the usual spoliation Bonaparte left a garrison at Malta under General Vaubois, and embarked on the 19th for Egypt. He escaped the English fleet under Nelson, and on the 29th of June came in sight of Alexandria, and landed a few miles from that city without serious opposition. The garrison of Alexandria shut the gates and prepared for defence. The town, however, was easily taken; and Bonaparte issued a proclamation to the inhabitants of Egypt, in which he told them that he came as the friend of the Sultan to deliver them from the oppression of the Memlukes, and that he and his soldiers respected God, the Prophet, and the Koran. On the 7th of July the army moved on towards Cairo. They were much annoyed on the road by parties of Memlukes and Arabs; but, after a harassing march, they arrived on the 21st in sight of the great pyramids, and saw the whole Memluk force under Murad Bey and Ibrahim Bey encamped before them at Embabel. The Memlukes formed a splendid cavalry of about 8000 men, besides the Arab auxiliaries, and had about 20,000 almost worthless Fellah infantry. The great "battle of the Pyramids" was fought with them on 22nd June, 1798. They charged furiously, and for a moment disordered one of the French squares, but succeeded no further, having no guns to support them. They were easily defeated, and of the remnants of this fine cavalry part retreated towards Upper Egypt, and part crossed the Nile and retreated towards Syria. Bonaparte two days afterwards entered Cairo without resistance, and assembled a divan or council of the principal friendly sheiks. It is not true that he or any of his generals, except Menou, made profession of Islamism, but he came perilously near to it. One of his proclamations begins, "We are true Moslems as you yourselves. Have we not destroyed the Pope, he who said it was our duty to make war on Moslems? Have we not destroyed the Knights of Malta, because the idiots believed that God was pleased when they went to war with Mos-

lems?" &c. (2nd July, 1798). While Bonaparte was engaged in organizing the internal affairs of Egypt, the destruction of his fleet by Nelson took place in the roads of Aboukir (battle of the Nile) on the 1st and 2nd of August, 1798. He was now shut out from all communication with Europe. A popular insurrection broke out at Cairo on the 22nd of September, when the French found in the streets were killed. Bonaparte, who was absent, returned quickly with troops, and a dreadful massacre ensued, even after all resistance had been abandoned: 5000 Moslems were killed on that day. As for the French, we know their feelings, for Nelson intercepted their correspondence. Despair was openly expressed, and the feeling of the army was so dangerous that Bonaparte at last issued an order decreeing *death* to any officer who should complain in his hearing! Many blew out their brains, and others plunged in the Nile to end their sorrows. Bonaparte, too, saw that all was over, and that "the . . . (quite untranslatable) of the Directory will leave me here to perish," as he said to Bourrienne. He determined, therefore, to escape and leave the army to its fate. But first it was necessary to do something grandiose to take away the effect of Nelson's crushing victory of the Nile. He resolved upon a swift and brilliant campaign in Syria.

In February, 1799, he crossed the desert with 10,000 men, took El Arish and Gaza, and on the 7th March he stormed Jaffa, which was bravely defended. Two days afterwards, on the 9th, the 2500 prisoners whom he took were marched out of Jaffa in the centre of a square battalion commanded by General Bon. They proceeded to the sandhills south-east of Jaffa, and being there divided into small bodies, they were, in cold blood, put to death in masses by volleys of musketry. The bodies were heaped up in the shape of a pyramid, and their bleached bones were to be seen many years afterwards.

On the 14th of March the army marched towards Acre, which they reached on the 17th. Jezzar (that is, butcher) Pasha, a cruel, resolute old Turk, had prepared himself for a siege. Sir Sidney Smith, with the *Tiger* and *Theseus* English ships of the line, after assisting him in repairing the old fortifications of the place, brought his ships close to the town, which projects into the sea, ready to take part in the defence. Colonel Phélippeaux, a French officer of engineers, who had been Bonaparte's schoolfellow at Paris, and had been in prison under the Revolution with Sir Sidney Smith, where he helped him in his gallant escape (1798), directed the artillery of the garrison of Acre. Bonaparte was compelled to batter the walls with only twelve-pounders, but by the 28th of March he had effected a breach. The month of April was spent in useless attempts to storm the place: and, moreover, as Sir Sidney Smith captured a French convoy coming up from Joppa, Bonaparte had the humiliation of seeing his own siege-guns set up on the ramparts and fired at him with his own ammunition. On the 20th of May Bonaparte made a last effort, in which General Bon was killed, with most of the storming party. Seven or eight assaults had been made, the trenches and ditches were filled with the slain, which the fire of the besieged prevented them from burying; and disease, assisted by the heat of the climate, was spreading fast in their camp. After fifty-four days from the opening of the trenches Bonaparte saw himself under the necessity of raising the siege. Accordingly he resolved to return to Egypt.

On the 21st of May the French army broke up from before Acre and began its retreat, leaving 8000 men lying in the sand before Sir Sidney's bravely defended "rubbish-heaps." The route lay through Jaffa, and everything was burned as they passed along, villages, harvest, and all. Before leaving Jaffa Bonaparte ordered the hospitals to be cleared, and all those who could be removed to be forwarded



to Egypt by sea. There remained 400 (Sir Robert Wilson says 580) patients, suffering from the plague, who were in a desperate condition and could not be removed. Napoleon asked Desgenettes, the chief physician, whether it would not be an act of humanity to administer opium to them. Desgenettes replied that "his business was to cure and not to kill." Some other physician was less scrupulous than Desgenettes, and the patients were found dead, except one or two, when Jaffa fell into the hands of the English. Bonaparte reached Cairo on the 14th of June, after a most disastrous march. But the hands were kept playing; a little affair at the Jordan was trumpeted forth as a great victory; the capture of Jaffa and Gaza and the "destruction" of Acre were boasted of as first-class achievements; and the "victorious army" was said to have "retreated only before the plague." No wonder that when the shameless mendacity of this extraordinary man was afterwards discerned, men made a proverb, "lying as a bulletin!" Napoleon was determined not to leave without some brilliant success to wipe away the memory of defeat. Fortunately for his plans, towards the end of July the Turkish fleet landed 18,000 men at Aboukir, under Snid Mustapha Pasha. Bonaparte immediately attacked them, and won the victory of Aboukir (25th July, 1799), in which 10,000 of the Turks are said to have perished either by the bayonet or in the sea. He learned from the papers he now obtained the disasters of the French armies at home, the loss of Italy, the general dissatisfaction prevailing in France against the Directory, the intrigues and animosities among the Directors themselves and between them and the legislative councils. He burned more than ever to return to France. He kept it, however, a secret from the army, and with a few favourite officers embarked at Alexandria on the 23rd of August, writing to Kléber to take command of the French army in Egypt, which amounted to about 22,000 men. To avoid the chance of refusal he appointed a meeting with Kléber "to confer on important matters," naming a day when he knew he should be some hundred miles and more at sea. When Kléber arrived he found his general fled, and himself left in command of a sick, broken, and dispirited army, hopelessly pinned in a hostile country. He wrote most bitter reproaches to the Directory, which, of course, all fell into Bonaparte's own hands. Bonaparte escaped the English cruisers, and anchored on 9th October in the Gulf of Fréjus, to the eastward of Toulon. Hurrying to Paris, he found himself courted by various parties. He decided on joining Sieyès and his friends, and giving him his military support; and the day for attempting a change in the constitution was fixed.

The Council of Ancients met at six o'clock in the morning of the 18th Brumaire (9th November, 1799) at the Tuileries, and resolved upon the reform of the constitution; and in a few days, by Napoleon and the army, acting nominally under the orders of the Council of the Ancients, quietly and without bloodshed, the revolution known as that of Brumaire was effected, all malecontents were banished, the Directory was abolished, and the executive vested in three provisional consuls—Sieyès, Ducos, and Bonaparte.

At their first sitting Sieyès having said something about turns of presidency, Ducos immediately replied, "The general takes the chair, of course." Sieyès perceived that his own influence was at an end; he and his friends had given themselves a master. The new constitution was called the constitution of the year VIII. Under it Bonaparte was appointed chief consul, with the right of appointing to all public offices and of proposing all public measures, such as war or peace, with the command of the forces of every description, and the management of the internal and foreign departments of the state, &c.

Bonaparte being thus appointed, or rather confirmed, in his office of first consul or chief magistrate, appointed Cambacérès and Lebrun second and third consuls. They,

together with Sieyès and Ducos, late consuls, appointed the majority of the members of the senate, who themselves appointed the remainder. The senate next named the 100 tribunes and the 300 members of the legislative body; and thus the whole legislature was filled up at once, under the pretence that there was no time to wait for lists of candidates to be named by the departments. The constitution was submitted to the people: 3,012,569 voted—1562 rejected, and 3,011,007 accepted the new constitution, which was solemnly proclaimed 24th December, 1799. The churches, which had been closed by the Convention, were re-opened, the law of the Decades was repealed, the computation by weeks resumed, &c.

France was still at war with Austria, England, and the Porte. The First Consul first confirmed Prussia in its neutrality, and then addressed a letter to the King of England in person, expressing a wish for peace between the two nations. Lord Grenville, secretary of state for foreign affairs, returned an evasive answer, expressing doubts as to the stability of the present government of France, an uncertainty which would affect the security of the negotiations. Bonaparte was not sorry his overture was rejected. He next turned to La Vendée, offered a complete amnesty for the past, and by the treaty of Montluçon in January, 1800, the Vendean war was practically brought to an end.

Bonaparte now was free to pay all his attention to the war against Austria. He gave to Moreau the command of the Army of the Rhine, and himself assumed the direction of that of Italy. He repaired to Lausanne on 13th May, 1800, and marched, with about 36,000 men and forty pieces of cannon, over the mountain pass of the Great St. Bernard, which had till then been considered impracticable for the passage of an army, and especially for artillery. The cannons were dismantled, put into hollow trunks of trees, and dragged by the soldiers; the carriages were taken to pieces, and carried on mules. The French army descended to Aosta in Lombardy, and found itself in the rear of Melas' Austrian army. Bonaparte entered Milan on the 2nd of June, without meeting with any opposition, and was there joined by other French divisions which had passed by the Simplon and the St. Gothard. He now marched to meet Melas, who had hastily assembled his army near Alessandria. Passing the Po at Piacenza, he drove back Melas' advanced guard at Casteggio, near Voghera, and on the 14th June the battle of Marengo was fought, in which, after a hard contest and immense slaughter, the Austrians were defeated. An armistice was concluded on the 16th of June between the two armies, by which Melas surrendered Piedmont and all the Genoese territory.

The First Consul having established provisional governments at Milan, Turin, and Genoa, returned to Paris, where he arrived on the 3rd of July, and was received with the greatest enthusiasm. Nevertheless, royalists and republicans were alike dissatisfied with the dictatorship of Napoleon, and several plots were formed against his life, the most serious of which was that of the "infernal machine," on 24th December, 1800, from which he had a narrow escape, and on account of which many persons were executed. Meanwhile Moreau defeated the Austrians, commanded by the Archduke John, in the great battle of Hohenlinden, and advanced towards Vienna, and the French in Italy drove the Austrians beyond the Adige and the Brenta.

Austria was now obliged to make a separate peace with France (treaty of Lunéville, 9th February, 1801). In England, Mr. Addington had succeeded Mr. Pitt as prime minister, and Egypt and Malta having surrendered to the English, the chief obstacles to peace were removed. The preliminaries of peace with England were signed at Paris, 10th October, 1801, and the definitive treaty was signed at Amiens, 26th March, 1802. The principal conditions were, that Malta should be restored to the Knights of St. John (which provision, as we shall see later, was never

executed); the independence of the new Batavian, Helvetic, Cisalpine, and Ligurian republics was guaranteed; Egypt was restored to the Sultan, the Cape of Good Hope to Holland, and the French West India Islands to France. England retained the island of Ceylon.

In April, 1801, a general amnesty had been granted, with certain exceptions, to all the *émigrés* of the revolutionary times who chose to return to France and take the oath of fidelity to the government within a certain period; and such property of the returned emigrants as had not been sold was restored to them. Another conciliatory measure was the Concordat concluded with the Pope in September. Pius VII. made several concessions seldom if ever granted by his predecessors. He suppressed many bishoprics, he sanctioned the sale of church property which had taken place, and confirmed the total abolition of convents. On Easter Sunday, 1802, the Concordat was published at Paris, together with a decree of regulations upon matters of discipline, which were so expressed as to make them appear part of the text of the original Concordat. The Pope made remonstrances as to this unheard-of proceeding, to which Bonaparte turned a deaf ear. Regulations concerning the discipline of the Protestant churches in France were issued at the same time, as well as a decree that Protestant ministers were also to be paid by the state.

In January, 1802, Bonaparte, after considerable secret plotting, convoked together at Lyons the members of the provisional government of the Cisalpine Republic and others, who, when they met, agreed to a new constitution, and requested that the First Consul would assume the chief direction of its affairs. This he accepted for ten years, and took the title of President of the Italian Republic. On the 2nd August, 1802, Bonaparte was proclaimed Consul for life by a decree of the senate, which was sanctioned by the votes of the people in the departments, to the number of 3,500,000. A few days afterwards another decree of the senate appeared, which altered the formation of the electoral bodies, reduced the tribunate to fifty members, and paved the way, in fact, for absolute power. The First Consul now established the famous order of knighthood, both for military men and civilians, called the Legion of Honour (*Légion d'Honneur*).

Switzerland was at this time distracted by civil war. Bonaparte formed a new federation of nineteen cantons, with himself as mediator of the Helvetic League. He retained, however, for France Geneva and the bishopric of Basel, which had been seized by the Directory; and he separated from Switzerland the Valais, which he afterwards joined to France.

Bonaparte had directed a commission of lawyers of the first eminence, under the presidency of Cambacérès, to frame or digest a code of laws for France. The *Code Napoléon* constitutes perhaps the most useful bequest of Bonaparte's reign. [See CODE.] He also provided handsomely for public instruction, especially for scientific education.

The provincial administration of France was at this time reorganized upon one uniform plan, and was made entirely dependent on the central power or executive. Each department had a prefect, who had the chief civil authority. He was generally a stranger to the department, received a large salary, and was removed or dismissed at the will of Bonaparte. The mayors of the towns of 5000 inhabitants and upwards were appointed by Bonaparte; those of the communes under 5000 inhabitants, as well as all the members of the municipal councils, were appointed by the respective prefects. Thus all remains of municipal or communal liberty and popular election were quietly abrogated in France, and the chief outward results of the Revolution had ceased to exist. In September, 1803, a decree of the consul's, "in order," as it is cynically stated,

"to secure the liberty of the press," forbade any bookseller to publish any work until he had submitted a copy of it to the commission of revision. Journals had already been placed under still greater restrictions.

In 1802 Bonaparte lost St. Domingo, where the blacks revolted and destroyed a French army. At this time he re-established the slave trade in Guadeloupe and Martinique. Spain gave up Louisiana to France, which France afterwards sold to the United States for 15,000,000 dollars. By another treaty with Portugal France acquired Portuguese Guiana. In Italy France took possession of the duchy of Parma at the death of the Duke Ferdinand in October, 1802, and likewise of the island of Elba by an agreement with Naples and Tuscany. The annexation of Piedmont to France next filled up the measure of alarm of the other powers at Bonaparte's encroachments. England refused to deliver up Malta, on the ground that the treaty of Amiens had been violated in several provisions. On the 18th of May, 1803, England declared war against France, and laid an embargo upon all French vessels in her ports. In retaliation for this Bonaparte promulgated the shameful order of the 22nd May, that all the English of whatever condition found on the territory of France should be detained as prisoners of war; and General Mortier was sent to occupy the electorate of Hanover, which belonged to the King of Great Britain.

In February, 1804, the police discovered the conspiracy of Pichegru, Moreau, and Georges Cadoudal against the consular government, and it was also falsely asserted that the Duc d'Enghien was concerned in the conspiracy. Georges, Pichegru, and Moreau were arrested in Paris, and on the 14th of March a party of gendarmes from Strasburg crossed the Rhine, entered the neutral territory of Baden, surrounded the château of Ettenheim, seized the Duc d'Enghien and his attendants, and took him to the citadel of Strasburg. On the morning of the 18th the duke was put into a carriage, and taken under an escort to the Castle of Vincennes, near Paris, where he arrived in the evening of the 20th. A military court of seven members assembled at Vincennes that very night, and after a mockery of trial the prince was condemned, without a particle of evidence, sentenced to be shot, and the sentence was executed on the 21st of March by torch-light in the castle ditch of Vincennes. Of course the whole matter was a stroke of policy on the part of the First Consul. The prince was a Bourbon, grandson of the Prince of Condé, one of the exiled royalists, and his murder was a definite breach with that party, by which Bonaparte hoped to win the favour of the suspicious and alienated Jacobin friends of his republican youth. On the 6th of April Pichegru was found dead in his prison, strangled by himself, as was reported, but not believed. In the meantime a motion was made by one Curée, to bestow upon Napoleon Bonaparte the title of emperor, with hereditary succession in his family. Carnot alone spoke against the motion, which, however, was passed by a great majority on the 3rd of May. The resolution was then submitted to the people. Above 8,000,000 of the registered votes were favourable, and between 8000 and 4000 contrary. However, even before the votes were collected, Napoleon assumed the title of Emperor at St. Cloud, 18th May, 1804. On the 19th he issued a decree appointing eighteen of his first generals marshals of the French Empire. The decrees of the new sovereign were at first headed—"Napoleon, by the grace of God and the constitution of the Republic, Emperor of the French," &c.; but the name of the republic was afterwards dropped. In the month of June the trial of Moreau, Georges, and the others concerned in the conspiracy, took place. Twenty of the accused, with Georges at their head, were condemned to death; but a few were reprieved. Moreau, the only general of whose talent Napoleon was ever really jealously afraid, was banished to the United

States. (He was shot at the battle of Dresden, fighting against his country in the German army, in 1813. See the article MOREAU.) Napoleon was crowned by the Pope at Notre Dame in Paris (2nd December, 1804), and on the 26th of May, 1805, in consequence of a request from the senate of the Italian Republic, he was crowned King of Italy at Milan by the archbishop of that city; but it was stipulated that the two crowns of France and Italy should remain united only on Napoleon's head, and that he should appoint a separate successor to the Italian kingdom. He appointed his stepson, Eugène Beauharnais, his viceroy of the kingdom of Italy. A decree of Napoleon, of the 9th of June, united Genoa to France; and Lucca was transformed into a principality, and given to Eliza, Napoleon's sister, and her husband, Baciocchi, to be holden as a fief of the French Empire. Thus two more Italian republics disappeared; San Marino alone remained. In the preceding year (1804) Napoleon had assembled a large force on the shores of the Channel, with a flotilla at Boulogne, and had given it the name of "the Army of England." The invasion of England and the plunder of London were confidently talked of among his soldiers, but there is reason to think the whole affair was a gigantic hoax; for on the formation of a coalition between the alarmed powers of England, Austria, and Russia (with whom Sweden also joined herself), Napoleon at once declared war, and marched all his magnificent "English" force in his rapid manner upon the Rhine, appointing Massena at the same time general in Italy (August, 1805).

On the 23rd of September, 1805, the emperor went in state to the senate, where he delivered a speech on the occasion of the war. He then repaired to Mainz, where he took the command of the Grand Army—a name which was afterwards always applied to the army while he commanded in person. General Mack, completely taken by surprise by the lightning swiftness of Napoleon's movements, allowed himself to be surrounded at Ulm, and surrendered, on the 17th of October, with more than 20,000 men. The other Austrian divisions were unable to unite, and the French entered Vienna on the 13th of November. The Russian army had by this time assembled in Moravia, under the Emperor Alexander in person. Being joined by some Austrian divisions, it amounted to about 80,000 men. The great battle of Austerlitz was fought against this new foe on the 2nd of December, 1805. The two armies were nearly equal in number. The Russians and Austrians extended their line too much. Bonaparte broke through it, and separated their divisions, which, after a stout resistance, were routed in detail. The loss of the allies was tremendous. Thousands were drowned in the lakes in the rear of their position now covered with ice, which gave way under the weight. The Emperor of Austria had an interview with Napoleon the day after, and an armistice was concluded, by which the remaining Russian troops were allowed to retire to their own country. Peace between Austria and France was signed at Pressburg on the 26th of December, 1805. Austria gave up the Venetian provinces and Dalmatia to the kingdom of Italy, Tyrol to the Elector of Bavaria, and other districts, besides a contribution of 100,000,000 francs. Napoleon raised the Electors of Bavaria and Würtemberg to the rank of kings, and placed himself at the head of all the smaller German states, which he formed into the Confederation of the Rhine, under his protection. The old German Empire was thus dissolved. Soon afterwards, the Emperor Francis formally renounced his title of Emperor of Germany, and assumed the title of Francis I., Emperor of Austria. All these triumphs almost lost their savour to him by the fatal news which arrived amid them of Nelson's victory of Trafalgar over the French and Spanish (21st October, 1805). Overwhelmed by Napoleon's cruel reproaches the vanquished admiral (Villeneuve) committed suicide.

The King of Naples had meanwhile allowed a Russian and English army to land in his dominions. Napoleon sent an army to Naples in February, 1806, and King Ferdinand took refuge in Sicily. On this, a decree of Napoleon, March, 1806, appointed his brother Joseph king of Naples and of Sicily. On the 6th of June following, he appointed, by another decree, his brother Louis king of Holland, thus transforming by a stroke of the pen the Batavian Republic into a kingdom dependent on France. His brother-in-law, Murat, was made Grand-duke of Berg. Prussia had been a long time wavering; and, to keep her in good humour, Napoleon had made Hanover over to her, which, though at peace with England, she had accepted; but at length, on the 2nd of October, 1806, she declared war. The King of Prussia issued his manifesto from Erfurt, on the 9th of October, 1806, and in one week from that time Napoleon's double victory at Auerstedt and Jena (16th October) decided the campaign. He entered Berlin on the 21st of October. He at once despatched Mortier to occupy Hamburg and seize all English property there, and on the 21st of November, 1806, issued his well-known "Berlin decree" against British commerce, and founding what he called the *continental system*. He decreed a blockade of all the ports of the Continent against English commerce or correspondence, from the furthest Prussia to the Adriatic. All English property abroad was confiscate; all Englishmen prisoners, this too without any previous notice. All goods in English bottoms, even if not English goods, were lawful prize to any one who could take them. Thus frantically did Napoleon's hatred against the one free nation of Europe, and the enemy which he felt might one day prove his ruin, at last make itself fully manifest. The English retorted by "Orders in Council" against French ships entering English ports, &c.; but it is needless to say that French property in England was as safe as our own.

Meantime the King of Prussia had fled to Königsberg, and the Russian armies advanced to the Vistula. The French occupied Warsaw. Napoleon began his winter campaign against the Russians by the battle of Pultusk (28th December), in which the French, experiencing a severe check, retired towards the Vistula; but on the 8th of February, 1807, Napoleon thoroughly beat the Russians under Bennigsen at the great battle of Eylau. The battle lasted till near ten o'clock at night. The loss on both sides has been roughly estimated at 50,000 men. On the 13th of June the battle of Friedland took place, in which, after an obstinate struggle, the Russians were at last worsted. They were driven beyond the River Aller, and retreated to Tilsit, where an interview took place between Bonaparte and Alexander on a raft in the middle of the Niemen on the 25th of June, and soon afterwards a treaty of peace was finally signed. The King of Prussia was restored to about one-half of his former territories, as far as the Elbe. The duchy of Warsaw was given to the Elector of Saxony, who was made a king, and became the faithful ally of Napoleon. Russia made no sacrifices; on the contrary, she obtained a part of Prussian Poland. But there were secret articles to the treaty, by which France allowed Russia to take Finland from Sweden; and Russia, on her part, promised to join the "continental system" and close her ports against British vessels. On the 9th July, Napoleon left Tilsit to return to Paris. Having stripped the Elector of Hesse-Cassel of his dominions, under the plea that he had not joined him in the war against Prussia, as well as the Duke of Brunswick of his, on the ground that the duke had joined Prussia against him, Napoleon created out of these and other districts the kingdom of Westphalia, 18th August, 1807, and gave it to his brother Jerome, who took up his residence at Cassel. Soon after, the Prince Regent of Portugal having refused to enforce the "continental system" against England, Napoleon sent Junot with 30,000 men across Spain to take possession of

Portugal. At the same time he published in the *Moniteur* that "the house of Braganza had ceased to reign in Europe." Junot entered Lisbon without opposition, 30th November, 1807, the prince regent and his court having just before embarked for Brazil. In December of the same year, Napoleon seized upon Tuscany, and added it to France; and in the same month issued the "Milan decree" enlarging and enforcing the "continental system" founded by the "Berlin decree." He now demanded that the Pope should declare war against England. The Pope answered that he was a sovereign of peace, and could not declare war against any Christian power. Bonaparte insisted, and after a long and vexatious correspondence, in February, 1808, General Miollis entered Rome, occupied the Castle of St. Angelo, and began to do military duty in that city. The general took the papal troops under his own command. The Pope remained in his palace with the mere shadow of civil power, which he had no means to enforce.

We now come to another and most important transaction of Napoleon's reign, and what in fact in the long run brought all his vast power to the ground—the invasion of Spain. The government of Spain was in a most corrupt state; but she had been the humble and submissive ally of France, notwithstanding which, Napoleon had taken possession of some of her strongest fortresses, and at length, by gross treachery, having got the king and queen, as well as their son Ferdinand, the heir to the throne (who had, indeed, been proclaimed king upon the abdication of his father), to visit him at Bayonne, 30th April, 1808, Charles, the old king, was induced, half by force and half by cajolery, to resign his crown "in favour of his friend and ally the Emperor, of the French," and Ferdinand was detained in "honourable captivity" and compelled to resign his rights. Napoleon then issued a decree, appointing "his dearly beloved brother, Joseph Napoleon, king of Naples and Sicily, to the crowns of Spain and the Indies." By a subsequent decree, 15th July, 1808, he appointed "his dearly beloved cousin, Joachim Murat, grand-duke of Berg, to the throne of Naples and Sicily, which remained vacant by the accession of Joseph Napoleon to the kingdoms of Spain and the Indies." The memorable events which resulted from these nefarious transactions may be read in the numerous works written expressly on the subject of the Peninsular War. The number of French who perished during that war cannot be estimated at less than 250,000, if it does not approach rather 300,000. The loss of the Spaniards, soldiers and peasants, who were destroyed in detail on almost every spot in the peninsula, cannot be calculated, but it must have been greater than that of the French. Napoleon himself took no very great part in the war. He found time to rapidly run over the country at the close of 1808, receiving the capitulation of Madrid (4th December), abolishing the Inquisition, and putting everything on a workable basis. By 22nd December he had left again for Paris.

In the year 1808 Napoleon re-established titles of nobility in France. Lefebvre, who had taken Dantzic the year before, was the first duke (duke of Dantzic) that he created. Many others, both military and civilians, received titles from towns in Italy and Germany, with an income charged upon the revenues or national domains of the conquered countries. Both the titles and the incomes attached to them were made hereditary.

Early in 1809 a new Austrian war broke out. This time Austria came single into the field. She had made astonishing exertions to recruit her armies to the number of nearly 500,000 men. The Archduke Charles commanded the Austrian army of Germany, and the Archduke John that of Italy. The victory of Eckmühl (22nd April), the defeat of Aspern (21st, 22nd May), and the terrible revenge taken by the emperor in the huge slaughter at Wagram on the 6th of July occurred; the French again took Vienna,

and on the 14th of October the peace of Schönbrunn was concluded. Austria ceded Trieste, Carniola, and part of Croatia, Salzburg, Cracow, and Western Galicia, and several other districts, to the amount of about 2,500,000 inhabitants. The brave Tyrolese were abandoned to their fate. Hofer and others of their chiefs were seized by the French, taken to Mantua, and there shot. In 1809 also the French armies still occupied the States of the Church, and these were eventually annexed to France by the emperor on 17th May. The Pope, after repeated vain protests, at last excommunicated Napoleon, 10th June; whereupon the emperor had him arrested, 6th July, 1809, and after being taken to various places he was brought eventually to Fontainebleau, in 1812.

Soon after the return of Napoleon to Paris, he made known to his wife Josephine his determination to divorce her, although the Pope had refused his consent. Josephine was childless; and what perhaps weighed as much with Napoleon, the Emperor of Austria was willing to be allied to him by marriage. Napoleon was sincerely fond of Josephine, who had not been the faithfullest of wives, though her universal popularity had caused her to be of immense service to him. She on her side was devoted to him, and consequently the most painful scenes took place. At last the divorce was consented to by Josephine in presence of commissioners from the Senate, 15th December, 1809. On the 11th March following, Napoleon married by proxy the Archduchess Maria Louisa, who soon afterwards set off for Paris. The new empress bore her husband a son on 20th March, 1811, who was saluted by Napoleon as "King of Rome,"—an ominous title to those Italians who still fancied that the crown of Italy was to be, according to Napoleon's promise, separated from that of France. See NAPOLEON II.

In 1811 the first symptoms of coolness between Alexander and Napoleon manifested themselves. The complaints of the Russian landholders against the continental system had induced Alexander to abandon it at the close of 1810. Napoleon retaliated by several acts of aggression, and although all his most devoted followers warned him against the risks he ran so needlessly, he at last drove Alexander into open hostility. Napoleon declared war 22nd June, 1812; passed the Niemen on the 24th and 25th, defeated the Russians at Smolensko, 18th August, at the great battle of the Borodino (or the battle of the Moskowa) 7th September, and entered Moscow 14th September, 1812; but he found it deserted, except by convicts and some of the lowest class, who lingered behind for the sake of plunder. On the evening of this day the city was set on fire, but the fire was put down in the night. On the next day, the 15th, Napoleon took up his residence in the Kremlin, the ancient palace of the Czars. On the following night the fire burst out again, in many different quarters of the city, and no exertions of the French could stop it: the wind spread the flames all over the city, and on the third day Napoleon was obliged to leave the Kremlin, where he was in imminent danger. The fire raged till the 19th, when it abated, after destroying 7682 houses, about four-fifths of the town.

Napoleon remained among the ruins of Moscow for five weeks, a delay which ruined the whole campaign, and the motives for which have never been made clear. Possibly he was deceived in his calculations upon the temper of Alexander and of the Russian people. At last, on the 19th October, seeing no chance of making peace, Napoleon began his retreat. The army left Moscow 120,000 strong, but was soon reduced to one-half that number of fighting men: the rest formed a confused and disorderly mass in the rear, with an immense train of baggage and artillery. In this condition they were overtaken on the 6th November by the Russian winter, which that year set in earlier than usual. The wretchedness and the sufferings of the retreat

from Moscow have formed the subject of many a history, play, and novel. When Napoleon arrived at Oresa, in Lithuania, he had only 12,000 men with arms in their hands. Of 40,000 horses there were hardly 3000 left. In this plight he reached the banks of the Beresina, where he was joined by a corps of reserve of nearly 50,000 men. The passage of the Beresina, 26th and 27th November, cost him about one-half of his army thus reinforced. At Smorgoni, where he arrived on the 5th December, he took leave of his generals, left the command of the army, such as it was, to Murat, and set off in a sledge to Paris, where he arrived on the 18th December at night. The loss of the French and their auxiliaries in this campaign is reckoned on competent authority at 125,000 slain, 132,000 dead of fatigue, hunger, disease, and cold, and 193,000 prisoners, including 3000 officers and 48 generals, with 900 pieces of cannon and 25,000 waggons, caissons, &c.

Napoleon, after his return to Paris, exerted himself to recruit his army by fresh conscriptions, by drafting the National Guards into his skeleton battalions, by recalling all the men he could spare from Spain, and by sending the sailors of his fleet to serve on land. He thus collected again in Germany, in the spring of 1813, an army of 350,000 men. The King of Prussia had now allied himself to Alexander, and the allies had advanced as far as the Elbe. The Emperor of Austria remained neutral, and vainly offered mediation to his son-in-law. Napoleon dashed upon his enemies with his usual restless speed, and won the battle of Lützen, 2nd May, 1813, from the Russians and Prussians united. On the 21st he attacked them again at Bautzen, and obliged them to retire. An armistice was now agreed to on the 4th of June, and Bonaparte returned to Dresden, where Metternich came with fresh offers of mediation on the part of Austria. But Bonaparte refused to make any concessions. The armistice expired on 10th August, and Austria now joined the allies.

A series of battles was fought about Dresden on the 24th, 25th, and 27th August, between the Austrians and Prussians on one side, and the French on the other, in which the latter had the advantage; but several corps of the French army were defeated in various places, and at last, after a painful struggle between pride and necessity, Napoleon was obliged to begin his retreat upon Leipzig, followed by the allies. At Leipzig he determined to make a final stand. "One single victory," he said, "and Germany may still be mine." From the 16th to the 18th of October the first battle of Leipzig took place. It was fought gallantly on both sides, but the allies had now a great superiority in numbers, and the French were driven close. Finally, on the 19th of October, in the second battle, the French were driven out of the town. Bonaparte then commenced his retreat to the Rhine, which was nearly as disastrous as that from Moscow. In fact to get clear of Leipzig he did not scruple to blow up a bridge crowded with his own troops, who perished, while the remnant who had not yet crossed fell an easy prey to the pursuing armies. His army was completely disorganized. He was, however, able to fight his way at Hanau, 30th October, through the Bavarians, his late allies, who now wanted to oppose his passage. At last he reached the Rhine, and passing over the 70,000 or 80,000 men, all that remained out of the army of 350,000 with which he had begun the campaign, he placed them on the left bank while he set off for Paris, where he arrived on the 9th November. About 80,000 men left in the Prussian garrisons, Magdeburg, Dantzic, Stettin, &c., surrendered to the allies. The enormous losses and reverses of the French armies evoked a remonstrance from the legislative body, which was therefore at once dismissed. A new conscription of 300,000 men was decreed, and the taxes were at the same time ordered to be doubled; but the people were weary of these never-ending sacrifices, and in many departments it was

found difficult to collect either men or money. At the end of January, 1814, Napoleon began the campaign, which has been considered by tacticians as that in which he most strikingly displayed his astonishing genius for military combinations, fertility of resources, and quickness of movements. For more than two months he held at bay the various armies of the allies. But the odds were too heavy against him. While he, by a bold movement, placed himself in the rear of the allies, the latter marched upon Paris, and after a hard-fought battle, 30th March, took possession of the whole line of defence which protected that city on the north-eastern side. The empress had left it for Blois, and Joseph Bonaparte, after the battle of the 30th, quitted Paris also. Marshal Marmont, in command of the city, asked for an armistice; and this led to the capitulation of Paris, which the Emperor Alexander and the King of Prussia entered on the 31st, amidst the loud acclamations of the Parisians, tired of the crushing sacrifices they had endured. Bonaparte was forced, as his generals refused to follow him longer, to sign an act of abdication at Fontainebleau, on the 4th of April, 1814. The Emperor Alexander, always one of his ardent admirers, personally proposed that he should retain the title of emperor with the sovereignty of the island of Elba and a revenue of 6,000,000 of francs to be paid by France. This was agreed to by Prussia and Austria; and England, though no party to the treaty, afterwards acceded to it. The Bourbons were restored, and Louis XVIII., brother of the unfortunate Louis XVI., landed at Calais 24th April, 1814. On the 20th April Napoleon left Fontainebleau for Elba, and on the 4th of May, 1814, he landed at Porto Ferrajo there.

On the 26th of February, 1815, after only ten months' residence, Napoleon escaped from Elba. He embarked with about 1000 men of his old guards, who had followed him to Elba, and landed on the 1st of March near Cannes, not far from Fréjus. Thus began the famous Hundred Days (*Les Cent Jours*). Colonel Labédoyère, commanding the 7th regiment of the line, joined Napoleon. The rest of the march to Paris was a repetition of similar occurrences. The Bourbons were abandoned by the whole army; and Marshal Ney, sent by Louis XVIII. to stop Napoleon's progress, himself went over to him. Napoleon arrived at the Tuileries on the 20th of March, and supped off the meal prepared for the king, Louis XVIII. having only left the capital early in the morning by the road to Flanders.

The Congress of Vienna was still sitting rearranging the map of Europe after the downfall of him who had so completely upset it, when Talleyrand laid before them the news of Bonaparte's landing at Cannes. The Austrian, Russian, and Prussian armies, which had evacuated France, immediately resumed their march towards the frontiers of that country. Napoleon assembled an army of about 125,000 men, chiefly old troops, of whom 25,000 were cavalry, and 350 pieces of cannon, with which he advanced upon Châlons on the 15th June, the allies having concentrated in Flanders. On the 16th Napoleon attacked in person Marshal Blücher, who was posted with 80,000 men at Ligny, and drove him back with great loss. At the same time he sent Ney against part of the English army at Quatre Bras, which, after sustaining a severe attack, retained possession of the field. In the morning of the 17th, the Duke of Wellington, in consequence of Blücher's retreat, fell back with his army to the position of Waterloo. Napoleon followed him, after despatching, on the 17th, Grouchy, with a body of 30,000 men, to follow the retreat of the Prussians. On the 18th the battle of Waterloo took place. The events of the battle are well known. The French all day long made furious attacks with infantry and cavalry upon the British line, gained some advantages, took possession of La Haye Sainte, &c., but all the efforts of their cavalry could not break the British squares. In these repeated attacks the French cavalry were nearly destroyed.

At six o'clock in the evening, Billow's Prussian corps appeared on the field of battle, and soon afterwards Blücher came in person with two more corps. Napoleon now made a last desperate effort to break the English line before the Prussians could act: he directed his guard, which had not yet taken part in the action, to advance in two columns against the English. They were received with a tremendous fire of artillery and musketry; they attempted to deploy, but in doing so became confused, and at last gave way.

The battle of Waterloo finally closed a war, or rather a succession of wars, which had lasted with little interruption for twenty-three years, beginning with 1792. After the defeat of Waterloo, Napoleon, having given his brother Jerome directions to rally the remains of the army, hurried back to Paris. Napoleon signed his second abdication on the 22nd of June, 1815; but this time it was of his own accord, and against the advice of his intimate friends, Carnot, Lucien Bonaparte, &c. The abdication was in favour of his son, named by it Napoleon II., although the young prince had been with his grandfather, the Emperor of Austria, since Napoleon's fall in 1814. A provisional government was appointed by the Chambers, and they required that Napoleon should leave France, and embark at Rochefort for the United States. General Becker was appointed to escort him to Rochefort, where he arrived on the 3rd of July. The allies, who entered Paris on the 7th July, refused to acknowledge Napoleon's right to abdicate in favour of his son, and on the following day Louis XVIII. re-entered the capital, and resumed the government.

Napoleon at Rochefort, seeing that the whole country around him was submitting to the Bourbons, and being closely blockaded by the English squadron, went on board the *Bellerophon*, 15th July, 1815, saying to Captain Maitland, "I come to place myself under the protection of your prince and your laws." On the 24th the ship entered Torbay. On the 31st of July Admiral Lord Keith and Sir Henry Bunbury, under-secretary of state, came on board the *Bellerophon* to announce to him the final resolution of the British government—that the island of St. Helena should be his future residence. On the 7th of August Napoleon, violently protesting, and using every means of resistance, even to the issuing a writ of *habeas corpus* upon him as a witness in a hurriedly trumped-up trial by his English friends, was removed from the *Bellerophon* to the *Northumberland*, Sir George Cockburn's flagship, which was appointed to carry him to St. Helena, where he landed on the 16th of October, 1815.

By a convention signed at Paris, 20th August, 1815, between Great Britain, Austria, Russia, and Prussia, the custody of Napoleon's person had been intrusted to the British government. In July, 1816, General Sir Hudson Lowe arrived at St. Helena as governor of the island. From the very first interview a series of petty squabbles ensued, which continued during the remainder of Napoleon's life. In September, 1818, his health began to be visibly affected, but he would take no medicine. In September, 1819, Dr. Antommarchi, of the University of Pisa, came to St. Helena as physician to Napoleon. Towards the end of 1820 he grew worse, and remained in a weak state until the following April, when the disease assumed an alarming character. On the 5th of May, 1821, after being some time delirious, he breathed his last about eleven minutes before six o'clock in the evening. The following day the body was opened by Dr. Antommarchi, in presence of several British staff and medical officers, when a large ulcer was found to occupy the greater part of the stomach. (His father died of cancer in the pylorus.) On the 8th of May his remains were interred with military honours in Slane's Valley. The body was removed to Paris and deposited with great pomp in the Church of the Invalides, 15th December, 1840.

As to Napoleon's military genius, there is no question of its rare excellence; but examined as a man he is one of the most perplexingly non-human characters to be found. It is impossible ever to find Napoleon telling the truth, keeping a promise, trusting a friend, behaving generously to an enemy, honouring a woman, caring for the poor, merciful to the down-trodden, upholding integrity—in fact, doing anything whatever that is noble, except when it was manifestly useful to his present purpose. He knew no motive but interest, he acknowledged no criterion but success, he worshipped no god but ambition, and with an Eastern devotion he knelt at the shrine of his idolatry. Subsidiary to this, there was no creed that he did not pretend to profess, there was no opinion that he was not ready to promulgate: in the hope of a dynasty he upheld the Crescent; for the sake of a divorce he bowed before the Cross; owing his education to royal charity, he became the adopted child of the republic; and with a parricidal ingratitude, on the ruins both of the throne and the tribune he reared the fabric of his despotism. A professed Catholic, he imprisoned the Pope; a pretended patriot, he impoverished and finally ruined the country; and in the name of Brutus he grasped without remorse, and wore without shame, the diadem of the Cæsars. He played upon the vanity of the French as upon an instrument with many strings, leading them whithersoever he would. When they paused, murmuring and suspicious, there were always fireworks to dazzle and tempt them further onwards. What could be more happy than the phrase that "every private soldier had a marshal's *bâton* in his knapsack?" Even when he created his aristocracy of dukes and counts Napoleon veiled the reactionary nature of the proceeding, and enlisted democratic sympathies in its favour, by saying that "the old nobility must be humbled before the new."

The literature, either by way of direct history or indirect memoirs, &c., relating to this stupendous, almost extra-human character, is proportionately vast to its subject. All other accounts must give way to the intensely interesting history of Lanfrey, published from 1867 onwards, with an excellent English translation following each instalment a year or two later. Next in interest and value are the perfectly reliable "Memoirs of Madame de Rémusat," not published till 1880 (translated the same year), which throw light on the personal life of the man, as seen from the innermost chambers of his court by a pure-minded highly-born lady. Some of the episodes are revolting. Josephine appears in very winning guise, though her feebleness intellectually is fairly stated. More vivacious and extensive, but less accurate, and strongly Napoleonic in tone, are the "Memoirs of Madame Junot," wife of one of Napoleon's most devoted slaves and his intimate friend from her childhood. Her mother, Madame Permon, was very generous to the young soldier in his days of penury, and Napoleon would gladly have married her if she had consented, according to Madame Junot. This lady's brilliant book (eighteen vols., Paris, 1837) was carefully retranslated into English in 1883. The public aspect of Napoleon's career, as seen from within, is given more accurately than by Madame Junot, as is but to be expected, by the early school friend of Napoleon, and his secretary from 1796 onwards (including Egypt), by de Bourrienne—a man of independent mind, and not so blinded by his friend's magnificent genius as to be unable to see the truth of things, especially since his frankness subsequently caused his dismissal when the emperor's head was turned with glory. These memoirs were published in ten vols., 1830: there is a good translation. The "Memoirs of Marmont" (Duke of Ragusa), one of Napoleon's marshals, are also very valuable, but must be received with caution (eight vols., 1856). The "Consulate and the Empire" of M. Thiers (twenty-one vols., Brussels, 1845–69) is not now so highly esteemed as formerly. Napoleon's own works are quite unreliable.

Written by his dictation, for the most part, is the absurdly untruthful "Mémorial de St. Hélène" of the Count de las Cases, one of the few Frenchmen who shared his exile (nine vols., Brussels, 1828). There are also nine vols. more of "Mémoires pour Servir," &c., written at the emperor's dictation by Montholon and Gourgand at St. Helena, and two vols. of the campaign of Egypt, written to dictation by General Bertrand at St. Helena. The six vols. of "Mémoires et Correspondence of King Joseph Bonaparte," by du Casse (1845), are very valuable.

But better than all these, for those who will spend the not inconsiderable time necessary to pierce through the continual and shameless mendacity which forms a thick veil over the facts throughout, are the thirty-two volumes of Napoleon's despatches and correspondence, a selected part only of the enormous mass which once existed, published at Paris between 1858 and 1870; and the most important parts of which were excellently given to the English public by Captain Bingham in 1888. The history of this publication is most characteristic.

At the beginning of the Second Empire a commission was appointed to publish the correspondence, and fifteen volumes appeared in serial without the editors having made any alterations or suppressions in the documents which they selected. But when it became a question of printing letters which showed that Napoleon I. had ordered a *wholesale forgery of English bank-notes* that he might injure the credit of the Bank of England, the commission recoiled. The emperor (Napoleon III.) was consulted, and it was announced that for the future nothing would be published except what Napoleon himself would have agreed that the world should see. The interest and historical value of the last seventeen volumes of the imperial correspondence are therefore in nowise proportionate to those of the first fifteen. What happened to the mass of letters withdrawn from publication is not yet known. Some of them may be in England. A good number were discovered at the Tuileries after the revolution of the 4th of September, 1870, and were overhauled by a republican commission. Napoleon's epistolary activity was prodigious. Even in camp he often dashed off more than twenty letters a day with his own hand, besides those which he dictated to his secretaries; and it is believed that his correspondence during the eighteen years in which, as general, first consul, and emperor, he was the foremost man in France, amounted to not less than 20,000 papers. He meddled with everything, but never penned a line without purpose.

NAPOLEON II., the only child of Napoleon I., Emperor of the French. It is almost needless to say that the title Napoleon II., given him by the abdication of his father in his favour, was a perfect farce. It would have been forgotten altogether had it not suited the adventurer who styled himself Napoleon III., to try and fill up some part of the gap between his great uncle and himself otherwise than by the houses of Bourbon and Orleans, who had actually reigned. The mother of Napoleon II. was Marie Louise, archduchess of Austria, who married Napoleon I., 11th March, 1810, about three months after the divorce of the Empress Josephine. Her son, François Charles Joseph, was born at Paris, 20th March, 1811, and was almost at once created King of Rome. He seems to have been an amiable boy, but quite without special distinction, and indeed resembled his mother in character. In 1814 the King of Rome was taken by his mother to his grandfather, the Emperor of Austria, on the fall of Napoleon; and although at Elba and also in the Hundred Days Napoleon eagerly desired their return, they never saw him again. In 1818 the Emperor of Austria, Francis I., created the little King of Rome Duke of Reichstadt, and henceforth he was known by that title. He lived very quietly at the Austrian court till his death at Schönbrunn, of consumption, 22nd July, 1832.

NAPOLEON III., Emperor of the French, whose reign over France began with the butchery of the *coup d'état* and closed with the surrender at Sedan, was the reputed nephew of Napoleon I. His mother, Queen Hortense (née Beauharnais, daughter of Joséphine), had a very poor reputation; and the most that can be said of his parentage is, that though he resembled the Napoleons in not one single feature of mind or body, Louis Napoleon, king of Holland, always acknowledged him for his son. He much resembled the Duc de Morny, and always treated that statesman with the most marked and peculiar respect. It is almost certain that the duke was, if not his brother, his half-brother, and that the Count de Flahault was the duke's father. Napoleon was at any rate the youngest acknowledged son of Hortense, who was the great emperor's step-daughter and prime favourite; and he was named Charles, after the father of the King of Holland and of the emperor, and Louis Napoleon, after both those princes. He was born at Paris on the 20th April, 1808, in the queen's house in the Rue Lafitte. (His eldest brother had died in 1807, and Hortense's second son, Napoleon Louis, died in 1831.) Charles was much noticed by the emperor, who created him (boy as he was) a commander of the Legion of Honour. At the time of the birth of Charles Louis, the great emperor's older brother Joseph was, like himself, without children, and the eldest of his younger brothers, Lucien, was in disgrace; therefore the emperor virtually fixed the succession to the throne in the sons of the second eldest of his younger brothers, Louis. The future Emperor of the French—known until he attained the throne as Prince Louis Napoleon—was a boy of seven when the battle of Waterloo and the second restoration of the Bourbons drove him into exile under the care of his mother, who had been to all intents and purposes separated from her husband since 1810. Louis Napoleon was carefully educated by private tutors, and attended the college at Augsburg. In early youth he acquired a military training as an artillery officer in the federal army of Switzerland—working hard and observing closely. The death of Napoleon II., the Duke of Reichstadt, 22nd July, 1832, left Louis Napoleon the representative of the Bonapartist interest. Personally little known in France and Europe, he now began to aim at establishing a reputation through the printing-press, and between 1832 and 1836 he published several political and military works. The object of his political disquisitions was partly to effect a coalition between the Bonapartists and the republicans, whom Louis Philippe had disappointed; nor was he altogether unsuccessful. But he estimated too highly the value of the eulogies which his works received from a portion of the democratic press of Paris, as well as the support promised him by some officers of the garrison of Strasbourg, whom he met at the watering-places of Baden. On the evening of the 28th October, 1836, he arrived secretly at Strasbourg, where he had gained over at least one colonel of a regiment. Early on the morning of the 30th he appeared in the streets of Strasbourg; the regiment of his friend shouted "Vive l'Empereur," but the rest were stanch; the would-be emperor was easily overpowered and thrown into prison. Transmitted to Paris, he was placed at once by Louis Philippe on board a French ship, which sailed (21st November, 1836) with him to America; and after touching at Rio landed him at New York. He did not long remain in the United States, from which he was summoned by the news of his mother's dangerous illness. Hastening back to Switzerland, he was by her side when she died. Fearing the formation of another Bonapartist conspiracy Louis Philippe called on the Swiss to expel him from their territory, and threatened them with war if they refused. The spirited republicans flew to arms to defend the rights of asylum and of citizenship, and a war seemed inevitable, when Louis Napoleon spontaneously withdrew from Switzerland and found refuge



in London towards the close of 1838. In London he found many friends and mixed in good society; he figured at the Eglinton tournament in 1839. With his *fidus Achates*, M. de Persigny, he established a Napoleonic propaganda in the press; and in 1839 he published the most remarkable of his own works, the well-known "*Idees Napoléoniennes*," in which the "Napoleonic idea" was represented in its most attractive aspect, as "not a warlike idea, but one social, industrial, commercial, humanitarian." The work produced a certain effect; and other events concurring, in the following year Louis Napoleon imagined that his hour had come. In 1840 the French were excited and irritated by the isolation in which France was left on the Eastern question, and Louis Philippe was accused of truckling to England. In the May of the same year the memory of the great Napoleon had been revived with enthusiasm by the decree of the Chambers for the transfer of his remains from St. Helena to Paris. On the morning of the 6th of August, 1840, Louis Napoleon, with some fifty followers and a tame eagle, landed near Boulogne from a steamer they had hired in London; and they made the streets of that peaceful town vocal with the cry of "*Vive l'Empereur*." They were not joined by the soldiery; the national guard turned out to repel them; and finally, Louis Napoleon was captured on the beach as he was endeavouring to escape to the steamer. This time he was brought to trial before the Chamber of Peers, and in despite of Berryer's eloquent defence was condemned to perpetual imprisonment. The prison selected was the fortress of Ham in Picardy, on the banks and among the marshes of the Somme. After an imprisonment of nearly six years he escaped from Ham in the disguise of a workman, passing out with a plank on his shoulder during some repairs, on the 25th of May, 1846. During his imprisonment he had written much—a curious work on one of his favourite themes, the history and theory of artillery; newspaper articles, in which English freedom was contrasted with the repressive system of Louis Philippe; a project for a canal to connect the Atlantic and Pacific oceans; and last, not least, an essay on "the extinction of pauperism," by settling the unemployed, with a peculiar organization, on the waste or little-cultivated lands of France. From Ham Louis Napoleon returned to London, where he watched from the well-known house in King Street, St. James', the decline and fall of the government of Louis Philippe. He even served as a special constable during the Chartist scare of 1848. After the revolution in Paris in February, 1848, he at last reached that city, was elected representative of the Seine department by the enormous number of 119,752 votes, and in December was elected president of the French Republic by 5,587,759 votes, while only 1,474,087 were given to his closest competitor, General Cavaignac. Then commenced a struggle of three years between the president and the legislature of the republic. Louis Napoleon exhausted every possible ministerial combination. He had against him all the leading parties in the Assembly—the Orleanists and the Legitimists, who even attempted a "dynastic fusion;" the moderate Republicans, and the Reds. With the beginning of 1851 it was evident that a life-and-death conflict between the president and the Assembly was impending. The friends of the old dynasties rested their hopes on General Changarnier, the commander of the army of Paris, whom they intended to play the part of a French Monk in a new restoration. In January, 1851, Changarnier was dismissed by the president. The Assembly retaliated by cutting down the president's civil list and by refusing his demand for the repeal of the law of the 31st of May, 1850, which had disfranchised some 3,000,000 of electors of the class on which he leaned for support. The contest between the two chief powers of the state went on deepening through the summer and autumn of 1851. A proposal had even been made on 16th November, 1851,

to place the army under the direct control of the Assembly with what object was not concealed. The president now resolved to strike the long-expected blow. On the 2nd December, 1851, the anniversary of the battle of Austerlitz, appeared the proclamation dissolving the Assembly, restoring universal suffrage, and appealing to the people. Early in the morning the parliamentary leaders were arrested. The opposition which followed this *coup d'état* in Paris was quelled with great bloodshed. Troops filled the streets and fired upon every one they saw, even upon women and children. Those who looked out of windows were mercilessly shot down. All that was noble and worthy in France was exiled or silenced; but there is no gainsaying that by whatever means obtained the popular decision ratified the president's treachery. By a national vote—according to the official statement, 7,478,431 against 641,351—Louis Napoleon was made president for ten years, with power to form a new constitution. The Senate of his own creation pressed on him the imperial crown; a national vote, 26th November, 1852, confirmed the proposal; and on the first anniversary of the *coup d'état*, 2nd December, 1852, the prince-president of the French republic became Napoleon III., Emperor of the French, by 7,824,189 votes against 258,145, exclusive of 63,326 spoiled votes not counted.

The imperial system being thus inaugurated, Louis Napoleon at once commenced a series of measures for the encouragement of industry and of public works. France soon began to feel material benefit. Vigour, energy, and consistency of action took the place of inertness, distraction, and discord both in the city and provinces. Commerce gradually revived, and industry began to flourish.

The new emperor desired to consolidate his throne and determined to marry; but when he sought for a wife among crowned heads he met with a refusal on all sides. On the 22nd of January, 1858, he notified to the Senate his intention to marry Eugénie de Montijo, countess de Téba, a lady of princely though scarcely of royal descent, and in whose veins flowed some of the best blood of Spain and Scotland. The marriage was celebrated in the midst of general rejoicing at Notre Dame, on the 29th of the same month. The only issue of the marriage was a son, known as the Prince Imperial, who was born at the Tuileries on the 16th of March, 1856, and baptized by the name of Napoleon Eugène Louis Jean Joseph.

Towards the close of 1853 rumours arose of a difficulty that had arisen between Russia and Turkey, which threatened to increase and spread until it assumed the proportions of a European war, and involved the Western powers as well as the Eastern. The Emperor Nicholas made overtures to France (as indeed he had done previously to England) to settle Turkey by a private understanding or arrangement. But Napoleon knew too well to enter into any such arrangement. Union with England, whose strength he had learned by residence in the country to appreciate, and whose commercial principles he desired to adopt, was a necessity for him; and when this union could also be made to include the practical certainty of military glory his eagerness knew no bounds. England unfortunately was little alive to the new emperor's necessities, and we drifted into the absurdly unnecessary bloodshed and waste of the Crimean War. England and France invaded Russia in alliance with the Sultan, and accompanied by a small Sardinian army, the wily diplomacy of Count Cavour seizing the opportunity to show that the little Piedmontese kingdom was the progressive and adventurous power in Italy, and so to put in a claim for future Italian extension should occasion serve. While the war was still pending, in the early summer of 1855, the Emperor Napoleon together with the Empress Eugénie paid a state visit to London and Windsor, and received a very hearty welcome. On the 30th of March in the following year (1856),



peace with Russia was signed at the Tuileries between the plenipotentiaries of the Eastern and the Western powers; and the English government declared in Parliament, that the happy termination of a season of trial, suffering, and sacrifice must be ascribed in a very great measure to the cordial co-operation and generous confidence of our faithful ally, the Emperor of the French. In the beginning of 1858 an attempt was made on the emperor's life by an Italian named Orsini, who was executed in consequence. It appeared, on investigation, that the plot was contrived in London, and a Dr. Bernard was tried at the Central Criminal Court for complicity in it. His acquittal caused a temporary coolness between the two countries, which was increased by the rejection of a bill introduced into Parliament by Lord Palmerston for altering the law relating to such conspiracies. This coolness did not suit Napoleon's policy. He veered again therefore and joined England in the Chinese War, of which we have long now been so heartily ashamed. The troops landed at the close of 1857, and Peking fell in 1860.

The year 1859 and the following year were occupied by a war in Italy, in which the emperor took the field in person, in order to assist Victor Emmanuel in ridding the north of Italy from the Austrian rule. His troops, in concert with those of the Piedmontese king, gained the victories of Magenta and Solferino. But although he had loftily declared that Italy should be free from the Alps to the Adriatic, he did not hesitate when a moment arrived that was suitable to his own designs, to conclude, amid the execrations of all Italian patriots at this shameful betrayal, the peace of Villafranca, which ceded to Sardinia Lombardy and the duchies, while leaving Venetia still subject to Austria. As payment for his services, Louis Napoleon annexed Savoy to France, taking it from Sardinian rule. As this was the ancestral home of the King of Sardinia, the bargain seemed particularly cruel. But the demands of Italian unity could not be falsified by the treachery of a vacillating ally. Garibaldi led the glorious campaign which immortalized him, and Victor Emmanuel, once only king of little Sardinia, was recognized in 1861 as king of a united Italy. Rome, however, was withheld, and the papal rule was maintained there by French bayonets. The French occupation of Rome dated from 1849, in the times of the presidency, when to anticipate the action of Austria the prince-president had overthrown the then existing Roman republic by force, and restored the Pope. Napoleon III. at last could resist public opinion no longer, and in September, 1864, he concluded with the King of Italy a treaty, in which he pledged himself to withdraw the French troops from the occupation of Rome, if the papal government should prove able to organize an army sufficient for the defence of its territories, which at the same time the King of Italy guaranteed to protect from external attack. Under the terms of this treaty the French troops were withdrawn in the winter of 1866-67; but before the close of the following year they returned to Rome to defend it from the assault of Garibaldi and his followers, whom they beat back, though not till after considerable blood had been shed on the fields of Mentana and Monte Rotondo.

The campaign of 1859 had therefore brought more contempt than applause; the emperor had been proved a nerveless commander, and had more than once only been saved from disaster by the courage of his generals. Napoleon again turned to England as an ally, and first concluded the famous commercial treaty of 1860 (through Mr. Cobden), and then joined in an armed expedition to Mexico undertaken by England, France, and Spain (1861). He fancied he saw at last an opportunity for that military prestige which was the breath of life to his government, in which no statesman of the greatest eminence could be induced to figure, and to his court, whose dissipation and

false glitter was the mock of reputable Europe. He therefore broke with his allies, refused to treat with the Mexican President Juarez upon the matters in dispute, and, on the withdrawal of the English and Spanish he went to war with Mexico (1862), overthrew the government, set up the Austrian Archduke Maximilian as Emperor of Mexico, but after all was compelled in the end to withdraw his forces in the most humiliating manner (1866-67). Mexico shook herself free from the invaders, and Maximilian was caught and shot (19th June, 1867).

Napoleon's prestige was now entirely shattered. His health failed, the growing contempt of France weighed upon him, and he sank into profound apathetic melancholy. A failure to seize a mean advantage in a matter of diplomacy over the Luxemburg duchies reduced his credit to the lowest ebb on its exposure. He saw no refuge but the desperate one of war. Its seat was not difficult to fix. Already the French people were becoming bitterly jealous at the spectacle of Prussian aggrandizement. Proud of their former military fame and pre-eminence in continental Europe, they saw with pain and surprise that their neighbour Prussia, at the head of the North German Confederation, was rapidly outstripping them as regards geographical dimensions and political and military power. The successes of Prussia, under the guidance of Count Bismarck, both in Schleswig-Holstein and Austria (Sadown, 1866), caused the French to welcome war with this new and dangerous rival. Four years were spent in preparations for the struggle. The older class of small fire-arms were superseded by the breechloading Chassepot rifle, which was supposed to be equal to the needle-gun of the Prussians, and great reliance was placed on a new engine of destruction called the mitrailleuse. All that was wanted was an excuse to declare hostilities.

Such an excuse was found in the attempt to place a Prussian prince, Leopold of Hohenzollern, on the throne of Spain (3rd July, 1870). Although, at remonstrances from France, Leopold withdrew his candidature, the matter was not settled, for the King of Prussia declined to say that the prince would not be put forward at a subsequent opportunity. Diplomacy, and a little patience, might have adjusted differences, but the French honour was compromised, or so it was loudly professed, and war was proclaimed on 15th July. Napoleon at once placed himself at the head of the army, and departed for the seat of war on the banks of the Rhine, taking his son, the Prince Imperial, a boy of fourteen years of age, with him (28th July). The subsequent events are well known, and in the article FRANCE will be found details of the disasters of the French armies, due more to the many years of trickery and speculation during which a band of mere adventurers had wasted and ruined France than to any other cause. Generals without training, troops without proper food or clothes, and regiments far beneath their proper strength, such was the Nemesis awaiting this man, which culminated in the final catastrophe at Sedan. After surrendering himself a prisoner at the latter place, the dethroned emperor was sent to Wilhelmshöhe, near Cassel, and remained there in captivity till the conclusion of the war, when he rejoined the empress and his son at Chislehurst, in Kent. Here he lived quietly, like an English country gentleman whose shattered health condemned him to retirement and the society of a few intimates. He died on the 9th January, 1873, and his remains were interred in the little Roman Catholic chapel in the village. Here also, in July, 1879, were laid the remains of his son, Prince Louis, who met his death at the hands of the Zulus in South Africa (1st June, 1879), whither he had accompanied the British army.

Napoleon was a dreamy, shifty plotter, always failing at the moment of action, full of vague socialistic ideals, and perhaps animated in a dim way with a wish to do well for France. He was probably in his inmost nature not a bad

man; but for France he was worse, namely a weak man, hurried from crime to crime by his own shiftlessness and the tyranny of the unscrupulous gang of adventurers who alone consented to serve him. The actual conduct of affairs passed largely out of his nerveless hands. Incapable of decision, he was even unable to choose from the poor instruments which lay to his hand those who would serve him best. He was personally a kind and faithful friend, and never forgot a benefit; he was patient under adversity, and in most ways an amiable man. But what a curse he was to France was never fully known until, on 7th September, 1870, the newly created French Republic appointed a commission to classify and edit the secret papers of the imperial court, seized only three days before. These papers, published in two volumes, one of 480 the other of 288 pages, are now extremely rare. Those inculcated no doubt secured all the copies they could. One item is startling. From 1852 to 1870 the Bonaparte family, relatives of Napoleon III., received 70,000,000 francs in gifts and pensions (£2,800,000). The emperor's mistresses were costly. One of them, Miss Howard, had 5,500,000 francs between March, 1853, and December, 1854, and in the following July was begging for 2,500,000 more to pay debts with. As for the emperor himself, he had even as early as 1866 £1,000,000 deposited privately in London with Messrs. Baring "against a rainy day" (see Papers, p. 152, for Messrs. Baring's own list). The amount paid for spies, and for spies on spies, for a staff of persons whose duty it was to open letters passing through the post, &c., was, as may be supposed, enormous. Relatively still greater is the hush-money paid to the press. Thus one journalist alone, Granier de Cassagnac, received 750 francs a month regularly, and at least one large payment (of 160,000 francs) is traced to him. More than a fourth of the vast amount of secret-service money went to corrupt the press in this way. The wholesale robbery by public servants, which comes out in the frantic telegrams from the generals sent to the frontier at the beginning of the war in 1870 is appalling. General Faillly cries, "Send me money to feed the troops;" the Intendant at Metz complains, "There is at Metz neither sugar, nor coffee, nor rice, nor brandy, nor salt; and only a little pork and biscuit." Another general complains, "The depot sends packets of maps of Germany, useless for the moment, while we have not one map of the frontier of France," and so it goes on. All ready on paper "to the last gaiter button," as the minister of war boasted; in actual fact, the money all stolen, and absolutely nothing to be found of it. All the conspirators of the *comp d'état* grew rich, and not only by sheer plunder of the public purse, but in such ways as the following:—A letter in these papers from a great banker who had had claims on Mexico begins, "You are no doubt ignorant that in this affair I had as partner the Duc de Morny, who engaged for 30 per cent. of the profits to compel payment by the Mexican government!" And this man, who for 80 per cent. embroiled France with Mexico, was popularly believed, and almost acknowledged to be, the emperor's brother.

**NAPOLEON**, the name by which the leading gold piece of France is still known. Its nominal value is twenty francs. Its weight and fineness are most accurately measured; it is therefore as steady as the English sovereign in value. It weighs 6.45161 grammes, and is .9 fine; it is thus worth 79286 of an English sovereign, or 15s. 10½d. The common price of 16s. is therefore a trifle in favour of the French owner.

**NAPOLEONITE**. See CORNITE.

**NA'POLI DI MALVASIA** (*Monemvasia*) is a town of Greece, built on a small island on the east coast of Laconia, and connected with the mainland by a bridge. About 4 miles N. of the bridge are the ruins of Epidaurus Liméra. As Epidaurus fell into decay, the town on the island grew into importance, and it then probably assumed

the name of Neapolis. It was a place of some consequence under the Byzantine emperors, and Andronikos Komnenos in the twelfth century founded here a monastery, which still exists. The town, which is a poor place with narrow steep streets and about 400 houses, including those on the summit of the hill near the castle, gives title to a Greek archbishop. The country in the neighbouring district formerly produced a luscious wine, to which the English gave the name of *Malmsey*.

**NARBADA'** (*Narmadā*—the *Narmadus* of Ptolemy, *Narmnadi* of the *Periplus*), one of the great rivers of India, traditionally regarded as the boundary between Hindustan Proper and the Deccan. It rises (lat. 22° 41' N., 81° 49' E. lon.) in the dominions of the Rajah of Rewah, and, after a westward course of 800 miles, falls into the sea (21° 38' N. lat., 72° 30' E. lon.) below Broach, in the Bombay district of that name. The total area of its drainage basin is estimated at 86,400 square miles. Its maximum flood discharge has been calculated at 2,500,000 cubic feet of water per second. The velocity of the current in the dry season at Broach city is less than one mile an hour. Throughout its entire course the Narbada drains rather than waters the country through which it flows. It is therefore nowhere utilized for irrigation. Navigation is confined to the lowest section, which lies within Guzerat.

In religious sanctity, the Narbada ranks only second to the Ganges among the rivers of India. According to the *Devā Purāna* (*Devā* being another name for the river), the sanctity of the Ganges will cease in the Samvat year 1951 (1895 A.D.), while the purifying virtue of the Narbada will continue the same throughout all the ages of the world. So holy is the water, that the very pebbles in its bed are worn into the shape of the emblem of Siva. Few Hindus would dare to forswear themselves, standing in the Narbada with a garland of red flowers round the neck and some water in the right hand. The most meritorious act that a pilgrim can perform is to walk from the sea up to the source at Amarkantak, and then back along the opposite bank. This pilgrimage, called *parikram* or *pradakshana*, is chiefly undertaken by devotees from Guzerat and the Deccan, and takes from one year to two years in accomplishment.

**NARBONNE**, a city in the French department of Aude, stands near the coast of the Mediterranean, 98 miles E.S.E. from Toulouse, and had 28,378 inhabitants in 1886. It is one of the oldest cities of France, and was the *Narbo-Martius* of the Romans, who planted here their first colony west of the Alps in 112 B.C., but every trace of its Roman structures has been swept away with the exception of a few fragments of capitals and marble slabs with inscriptions. The city suffered greatly from an invasion of the Saracens in 719, who planted a Moslem colony, and from an irruption of the Norsemen in 869.

The town is situated on the railway from Bordeaux to Cette, and is intersected by the La Robine Canal, which communicates with the Mediterranean and the Canal-du-Midi. The Cathedral of St. Just, founded in 1272, and finished only within the present century, is a handsome Gothic church; it has a splendid nave and choir, which are richly ornamented with good sculptures, and contains several marble monuments. The city has civil and commercial tribunals, museum, library, and a theatre. The chief industrial products are brandy, verdigris, bricks, tiles, pottery, linen, leather, and paper. The inhabitants trade in corn, wine, brandy, oil, salt, soda, wax, and excellent honey, the latter, in fact, being the best in France, both for colour and flavour. Narbonne has given title to an archbishop since 419; the see, however, is now united to that of Toulouse, the prelate being styled Archbishop of Toulouse and Narbonne.

**NARCEINE**, one of the alkaloids, obtained from opium. It crystallizes in silky needles, having the formula

$C_{22}H_{20}NO_6$ . It has a bitter taste, and is very soluble in alcohol, insoluble in ether, and sparingly soluble in water. It melts at  $92^\circ C.$  ( $197^\circ$  Fahr.) Iodine colours it dark blue. It is also soluble in potash, soda, and ammonia. It forms salts with acids, of which the hydrochlorate,  $C_{22}H_{20}NO_6HCl$ , is the best known. It crystallizes in prisms, and is very soluble in water and alcohol. It forms a chloroplatinate,  $C_{22}H_{20}NO_6HCl PtCl_2$ , also crystallizing in minute prisms. It is used in medicine as a soporific, in doses of half a grain to one grain, and is said to produce less headache and perspiration than morphine.

**NARCIS'SUS** (correctly *Narkissos*), in Greek mythology, was the son of the river-god Kephissos, and the nymph Liriope. His vanity was equal to his extraordinary beauty, and brought with it its own punishment, for continually contemplating his face in a clear fountain, he fell in love with himself, and gradually pined away. In the place where he died sprang up the beautiful flower which still perpetuates his name. Some poets give us as the reason for his fate, his hard treatment of the nymph ECHO, who for love of him and despair at his cruel contempt, faded away till only her voice was left; whereupon Nemesis, the goddess of vengeance, punished Narcissus as in the myth.

NARCISSUS also was the name of the notorious freed slave of the Emperor Claudius. He brought about the execution of the infamous Empress Messalina when she would no longer work with him to hoodwink the easy emperor and plunder the state. He probably was concerned in the murder of Claudius by the command of Agrippina, but he was too wealthy and cunning for the empress to suffer him to live, and she had him put to death, 54 A.D. By shameless speculations he was found to have amassed 400,000,000 sesterces, over £3,000,000 of our money.

**NARCIS'SUS** is a genus of MONOCOTYLEDONS belonging to the order AMARYLLIDACEÆ, among which it is known by its flowers growing upon a scape, and having a cup at

the mouth, the stamens that are opposite the sepals being longer than the other three. The genus consists of bulbous plants, principally inhabiting the warmer parts of Europe; only one species, *Narcissus pseudo-narcissus*, or the common daffodil, being found plentifully so far north as Great Britain, with two others, *Narcissus biflorus* and *Narcissus poeticus*, apparently wild. The typical form is represented by *Narcissus poeticus*. Those which have flowers like the daffodil have been placed together in the Ajax group. The rush daffodils, or Ganymedes group, have a slender drooping tube and a short cup. The Polyanthus group have a slender, upright tube (see fig.) The Corbularias, or hoop-petticoat daffodils, have a funnel-shaped tube.

**NARCOTICS** (from the Greek adjective *narkōtikos*, which is from *narkē*, a stiffening, stupor, or insensibility), a class of medicines that may be defined as agents which, in moderate doses, cause a temperate increase of the action of the nervous and

also of the vascular system, followed more or less speedily by a marked diminution of this action, terminating generally in sleep. When the dose is large the excitement is scarcely perceptible, while the diminished power of the nervous system is so manifest that an appearance of coma or apoplexy is induced. All the agents included in this class are capable of producing a state termed narcosis or narcotism, which, if not quickly removed, by a natural subsiding of their influence, or by artificial means, may terminate in death. Many of them are, therefore, as familiarly known as poisons as therapeutic agents. Their power of inducing sleep has procured for them the name of hypnotics or soporifics; and the property which many of them possess of alleviating pain, by blunting the sensibility, has obtained for them the appellation of anodynes, or, from one of the best known among them, simply of opiates. The principal hypnotics are opium, morphia, chloral hydrate, hyoscyamus, lactucarium, and the hop. Of anodynes the chief examples are opium and some of the alkaloids in it, *Camnabis indica* or Indian hemp, belladonna, hyoscyamus, and the anæsthetics chloroform, ether, and ethidene.

The most important consideration respecting them is the circumstance of their depressing action being always preceded by stimulation. This peculiarity renders their employment difficult in some cases and improper in others. Diversified as narcotics are in their nature and modes of action, there is this common property, that they all make a direct impression on the extremities of the nerves (to whatever part of the body, with few exceptions, they are applied); but their full and ultimate effects do not take place till they are absorbed and mingled with the circulating fluid.

No set of medicines have their action more modified by a variety of circumstances—such as the quantity given, or the frequency of repetition, also the force of habit, climate, or season, but, above all, by idiosyncrasy. Age also has an important share in determining the amount of action. Children do not in general bear them well, and therefore though they are very subject to convulsive and spasmodic diseases, other means should be employed, especially the removal of the source of irritation when practicable. The various nostrums recommended for children generally contain some narcotic, and prove a fertile cause of the mortality in early life. The administration of narcotics requires more knowledge and judgment than that of any other class of remedies, and should only be had recourse to under competent advice. In those terrible abodes of suffering, our cancer hospitals, the method of all others most resorted to and most efficacious for the alleviation of pain, is the subcutaneous (under-the-skin) injection of morphia. In sciatica, neuralgia, and other painful nervous affections, this remedy is also often exceedingly beneficial, provided its use is under proper medical supervision; but like every other good thing it is open to great abuse, and often made use of merely as a soothing narcotic by the irritable, excitable, and discontented. Sleeplessness is frequently treated by opiates, until sleep will not come without them. Chloral, chloroform, or chlorodyne are in multitudes of cases taken for every common or trifling ailment; and a bad habit of flying to drops of a narcotic for any passing *malaise* being once formed, the bodily strength is soon undermined, the digestive powers enfeebled, the mind and intellect weakened and enervated, and the unfortunate sufferer becomes a slave to a habit it is almost impossible to shake off.

In spite of the so-called "recommendations of the faculty" in favour of chlorodyne, &c., it cannot be too well understood that *no* narcotic is harmless, but on the contrary, invariably pernicious, when taken otherwise than under the restrictions already mentioned.

**NARCOTINE**, an alkaloid obtained from opium, from which it may be extracted direct by exhausting the drug with ether; but it is usually prepared from the mother liquors resulting from the preparation of morphia, which contain it in considerable quantity, and from which it is



Polyanthus Narcissus.

also of the vascular system, followed more or less speedily by a marked diminution of this action, terminating generally in sleep. When the dose is large the excitement is scarcely perceptible, while the dimin-

precipitated in the crude state by ammonia. It crystallizes in rhombic prisms, having the formula  $C_{22}H_{23}NO_7$ . It melts at  $170^{\circ}C$ . ( $338^{\circ}F$ .) It is insoluble in water, but soluble in alcohol and ether. It is very soluble in chloroform, which is the best solvent, in acetic ether and in oils. It is insoluble in potash and ammonia. It is a narcotic poison, and is used in medicine in doses of 1 grain to 3 grains, as an antiperiodic for remittent fever and ague, in which it is second only to quinine. When acted on by oxidizing agents it yields opianic acid ( $C_{10}H_{11}O_6$ ) and cotarnine ( $C_{12}H_{13}NO_3$ ). Heated with strong hydrochloric acid it yields chloride of methyl; heated to  $200^{\circ}C$ . ( $392^{\circ}F$ .) with caustic potash it yields methylamine. Narcotine is a weak base, and the salts formed with acids are not very soluble. The hydrochlorate is soluble in water, and crystallizes in needles; it forms a chloromercurate and a chloroplatinate, the latter a yellow crystalline precipitate having the formula  $C_{22}H_{23}NO_7 \cdot HCl \cdot PtCl_2$ .

**NARD** (*Nardostachys*), a genus of plants belonging to the order VALERIANACEÆ. The species are herbs with sweet-scented roots. *Nardostachys Jatamansi* is a native of Nepal, on the Himalaya Mountains, and in Delhi, Bengal, and the Deccan. This species is considered by some botanists to be the true spikenard of the ancients, and is esteemed not only as a perfume, but as a stimulant medicine. Nard is also a name given to a grass (*Nardus stricta*), otherwise known as mat-grass. It grows on dry moors, and is eaten by sheep.

**NA'RES**, the technical term for the nostrils and the corresponding pair of orifices into the throat (posterior nares). See NOSE.

**NARES, JAMES**, Doctor of Music (1715-83), was a pupil of Dr. Pepusch, and after serving as organist of York Minster succeeded Dr. Greene as organist of the Chapel Royal in 1756, taking his degree at Cambridge in the same year. He was a composer of far greater diligence than merit, but a few of his compositions are still heard in our cathedrals.

**NAR'SES** (473-568), a favourite eunuch and general of the Emperor Justinian. Belisarius having practically reconquered the revolted Italy for the empire, was superseded by Narsés, as the suspicious tyrant feared his brilliant talents. Narsés finished successfully what the greater general had left to do (552-53), and was rewarded with the "exarchate" or vicereignty. When Justinian died and his successor recalled Narsés, the latter, now over ninety, proposed to Alboin, king of the Lombards (barbarians who held the great Danubian plain), to invade Italy. His offer was eagerly accepted, but as the Lombards began to pour into Italy the wretched eunuch repented of his treason, and either killed himself or died of remorse.

**NAR'THEK**, a large space railed off by a screen at the western end of the early Christian churches in the Eastern (Roman) Empire, and still kept in the Coptic churches of Egypt, which have preserved so many of the customs of the Oriental church. The narthex was the place appointed for catechumens or novices during the services, the members only being allowed to enter the nave. It was also a place of discipline and penance, it held the baptismal font, and occasionally part of it was railed off for women. In the Coptic churches the great tank, which they (as immersion-baptists) formerly used in baptism, is a very distinctive feature of the narthex; it is always quite 8 feet long by 6 broad, and 5 or 6 feet deep, often larger than this. Its use for baptism has been abolished for many centuries, and it now serves only for an impressive ceremony on Epiphany-day, when it is filled with water, which the patriarch blesses, incensing it, and stirring it with his pastoral staff. Then the people rush forward, and the three foremost are solemnly immersed by the patriarch. The rest are sprinkled, and thus blessed for the year.

**NAR'WHAL** (*Monodon monoceros*), or Sea Unicorn, a cetaceous mammal belonging to the Dolphin family (Delphinidae). The narwhal closely resembles the BELUGA or white whale, except in its dentition. The adult narwhal has only teeth, the incisors of the upper jaw, which in the female are permanently rudimentary and useless. In the male, however, one, usually the left, is developed into a long, straight-pointed tusk or "horn" of solid ivory, the surface being marked with spiral ridges and grooves. This enormous tusk varies from 6 to 8 feet long. Occasionally both teeth are developed into tusks. The narwhal varies in length from 10 to 16 feet, and the tusk is usually more than half the length of the body. The colour is dark gray above with numerous darker spots, white on the sides and belly with grayish spots. The narwhal is an arctic form, frequenting the coasts of Greenland, Spitzbergen, and Siberia, and only occasionally appearing on the Scandinavian and British coasts. Narwhals are gregarious, and swim with great swiftness. When at the surface for respiration, they blow repeatedly with considerable force, and then frequently lie motionless for several minutes with their back and head just above water. Dr. Scoresby describes them as often sporting about his ship, sometimes in bands of fifteen or twenty together, often elevating their long tusks, and crossing them with each other as if they were fencing. They feed on cuttle-fish and other molluscs, crustaceans, and small fishes. It has been conjectured that the horn is employed in spearing fish, or in stirring up food from the bottom; but this would place the females at a great disadvantage. As the tusks are frequently found broken, they may be weapons used for fighting, developed like the horns of ungulates through sexual selection. The blubber yields a very superior oil, which, as well as the flesh, is considered a dainty by the Greenlander, who kills the fish with harpoons, &c., in the fissures of the ice, where it comes up to respire. The ivory of the tusk is considered superior to that of the elephant: it is very dense and hard, very white, is not liable to become yellow, and is susceptible of a high polish.

**NA'SAL**, anything specially appertaining to the nose (*Lat. nasus*). Hence in old armour the *nasal* was the point of the open helmet which lay along the nose and protected it. Also in philology the nasals are the modified resonant mutes, consonants, which are produced by help of the cavities of the nose. See the remarks under the letter N. The nasals in English are usually held to include *m*, *n*, and *ng*; and they lie high up in the class of consonants towards the vowels. They correspond to the sonant mutes *b*, *d*, and *g*, and the surd mutes *p*, *t*, *k*; and it is found that wherever a language has one of these, it has the other two, that is, any language using the nasal *m* freely will also have the relative surd *p* and the sonant *b*, and *vice versa*; and so with the other trines.

**NASA'LIS**. See PROBOSCIS MONKEY.

**NASEBY**, a village in Northamptonshire, about 12 miles north of Northampton. It was the scene of the decisive victory over Charles I., by the Parliamentary forces under Fairfax and Cromwell, 14th June, 1645.

**NASH, JOHN**, architect, was born in 1752. Few particulars are known of his early life, or when he first began to apply himself to architecture as a profession. He was the author or promoter of the very extensive improvements in the metropolis arising out of the formation of Regent Street and Regent's Park. Buckingham Palace, which was built by him, is, however, a decided architectural failure. In the Pavilion at Brighton he succeeded no better. The United Service Club-house, the Haymarket Theatre, and the terraces in St. James' Park, are among his other works. He died on the 18th of May, 1835.

**NASH, THOMAS**, the Elizabethan dramatist, was born in 1557, at Lowestoft, in Suffolk, and closed a calamitous life of authorship in his forty-third year. He has

left only one dramatic performance entirely of his own composition, "Summer's Last Will and Testament." Nash completed the unfinished play of his friend Marlowe, "Dido, Queen of Carthage" (1594). He excelled in wit and satire, but was an indifferent dramatist. As a young man he took an active part against the Puritans in the "Martin Marprelate" paper warfare.

**NASHVILLE**, a town of the United States and the seat of government of Tennessee, is situated on the south bank of Cumberland River, 560 miles W.S.W. of Washington. It is well built, with wide and regular streets, and has some elegant private dwellings. The Capitol, which stands on a commanding eminence, 175 feet above the river, is one of the best edifices of the kind in America. It is built of fine limestone, somewhat resembling marble. The other public buildings are the court-house, market-house, custom-house, university, Vanderbilt University (Methodist Episcopal), Methodist and Baptist colleges, orphan asylums, very large lunatic asylum, and numerous places of worship. The university was founded in 1806, and a medical college attached to it in 1851. The "Jubilee Singers," a troupe of emancipated slaves, by means of concerts in America and England raised about 80,000 dollars, with which Fisk University for coloured people was erected in 1877. The Cumberland is crossed by a suspension bridge. The river is navigable for steamers of considerable draught for a distance of 50 miles above the town, which is also the centre of an important network of railways. It has an extensive trade in the produce of the surrounding fertile district, and among its industrial establishments are flour and planing mills, manufactories of steam-engines and machinery, tanneries, and a large publishing house in connection with the Methodist denomination. In the American civil war the city was taken by the Federals under General Rosencranz. The population in 1880 was 43,641. "The Hermitage," in the neighbourhood, was once the residence of President Jackson.

**NASMYTH, PATRICK**, a Scottish painter of considerable merit (1787-1881), has been likened to Hobbema for his truthful rendering of rustic landscape. He is represented by three small examples in the National Gallery. His father, who outlived him, Alexander Nasmyth (1757-1840), was originally a portrait painter, but eventually took entirely to landscape. His works are not comparable in merit to those of his son.

**NASO OVIDIUS**. See OVID.

**NAS'SAU** (the state). See HESSE-NASSAU.

**NAS'SAU**, an ancient little town of Germany, believed to have existed as early as 790 under the name of *Nasonga*, is prettily situated on the right bank of the Lahn (here crossed by a suspension bridge), 25 miles north-west of Wiesbaden. It was the birthplace of the celebrated Prussian minister Stein, and his castle, though modernized, dates from 1621. On the opposite bank of the Lahn rises a wooded eminence crowned by the ruined Nassau Castle, the ancestral seat of the house of Nassau, erected about 1100, and suffered to fall to decay since the end of the sixteenth century. The population is 1500.

**NASTURTIUM**, an old word applied to some kind of pungent herb, such as cress, derived from Lat. *nasus tortus*, i.e. a nose twisted by the pungency. By the English of the present day it is given to the *Tropaeolum majus*, an American annual with pungent fruit; by botanists, to the watercress and plants allied to it; by the Romans it was applied to a plant resembling mustard in its qualities.

**NATAL**, a British colony on the south-east coast of Africa. Roughly speaking it has the shape of a diamond, with the four sides pretty equal. Its sea-coast is about 150 miles long; its opposite landward side is about 120 miles; its side towards Zululand is 150 miles, and that towards the Cape is 175 miles long. The line of greatest distance is that from the southern angle, at the mouth

of the Umtamvuna, to the northern, at the source of the Buffalo, a diagonal of about 250 miles long. The area is reckoned to be 17,000 square miles, or 11,000,000 acres. It is bounded on the south-east by the Indian Ocean, on the north-east by the rivers Buffalo and Tugela, which divide it from the Transvaal Republic and Zululand; on the south-west by the Drakenberg Mountains, the upper waters of the Umzimkulu and the Umtamvuna, which separate it from the Basutoland and Nomansland districts of the Cape Colony and Pondoland; and on the north-west by the Drakenberg, which divides it from the Free State.

Whether approached by sea or by land from the Cape, the country makes a very agreeable impression, owing to its freshly-verdant aspect, so strikingly different to the general aridity of the regions left behind. On gaining the last heights of the Drakenberg range from the interior, after passing over dry and sterile lands, the traveller hails with surprise the prospect of a well-watered, wooded, and grassy landscape, stretching for miles to the eastward, and can appreciate the feeling which led the first Dutch explorers to exclaim at the view, *Een andere wereld!* (Another world!) On nearing also the strand the voyager marks with delight a series of beautifully-sloped and round-topped hills, all green and luxuriant, some covered with grass, others with trees, which descend to the very water's edge, or to the white beach upon which the waves are playing. This is the appearance of the surface even in the hot months, when all vegetation is parched, brown, and dusty at the Cape. It is occasioned by the rains falling in this part of Africa in the interval from September to March, or during the summer of the southern hemisphere.

From the coast the land rises rapidly in four distinct steps or terraces, each averaging about 20 miles in breadth, and having its own peculiarity of soil and climate. In the maritime region there are fine woodlands and park-like scenery. The temperature ranges high, and though not strictly tropical, even in the height of summer, the climate admits of the growth of cotton, sugar, indigo, arrow-root, coffee, pine-apples, and other productions of the tropics. Further inland, as the country rises in elevation, the temperature is diminished and the air is refreshing, except when the hot wind blows from the north-west, the direction of the sun-scorched regions of Central Africa. This range of land, on which stands the capital, is almost bare of trees, but well adapted for the growth of maize and the usual harvests of Europe. Beyond this the higher terraces supply immense tracts of pasturage, with timber trees of considerable size and servicable quality.

Notwithstanding the generally broken character of the country, the only mountains are the Drakenberg or Kathlamba Mountains, which bound it on the north-west and rise to a great altitude, forming a barrier passable only in one or two places, and there with difficulty, and presenting steep fronts towards the south-east. The highest point is no less than 10,000 feet high. This is the Mont aux Sources, so called because it is a most prolific watershed. Another point on the ledge, as the Drakenbergen really is, known as the Champagne Castle, is 9500, while the Giant's Castle is 9000 feet above the level of the sea. The aspects of the great precipice along its whole length are grand and romantic, and most of the rivers of the colony take their course from this range to the sea; the Tugela, the Umvoti, the Umgeni, the Iloyo, the Uinkunani, the Umzimkulu, and the Umtamvuna are the chief, but not one is navigable. Some of them, however, especially in the rainy season, are considerable streams, and all of them have their tributaries, so that the land abounds in water-courses. Cataracts are numerous, and the Umgeni Falls, 10 or 12 miles north of Maritzburg, are famous for their beauty. Granite, trap, and sandstone underlie the beds of shale and vegetable soil which form the land surfaces;

and here and there those rocks, especially trap, show themselves in bare and eccentric forms. Table-mountains frequently appear, and one of the finest objects to be seen from Maritzburg is Tafel Berg, a splendid specimen of its class, about 16 miles from the city.

The climate is very fine, and though nearer the tropics than the Cape, its mean annual temperature is but little in excess of that of the more southern colony. At Maritzburg it is 64° to 71° Fahr., while on the coast the general range of the thermometer is from 53° to 90°. The winter is bright and comparatively cool, and the summer heat is softened by a clouded sky and frequent rains. The spring and autumn are agreeable periods of the year. Thunderstorms are of frequent occurrence during the summer months, and it is to these that the moderated heat of November, December, January, and February are due. Occasionally a hot wind from the land side blows over the colony, but seldom lasts two or three days in succession.

The natural wealth of the country only needs increased facilities for placing in suitable markets to prove very valuable. Coal measures of an excellent quality and fair quantity have been more than indicated in the district of Newcastle, on the north-eastern side of Klip River. Anthracite coal crops out at Morewood's Bay, on the coast. Extensive deposits are supposed to exist in the neighbourhood of the Umhali, in Victoria County, and a vein has been discovered about 15 miles from the mouth of the Umvoti. Indications of gold are not wanting, but there is no reason to anticipate a discovery of any value. A few years ago experimental digging and prospecting were not attended by any encouraging success. Iron is abundantly present. Signs of copper show themselves on the Illovo. Alexandria is known to possess valuable beds of slate and marble. Slate has again been found at Edendale, not far from Maritzburg. Granite crops out at "the Halfway-house," between Durban and the capital, while good building stone is to be had in large quantities at the Umhlatuzan quarries.

Large wild animals, rhinoceroses and elephants, once numerous, have either been exterminated by the hunter, or are only met with in the more retired districts, from which they are rapidly disappearing. Alligators abound in some of the rivers, with hippopotami, and serpents allied to the boa are not uncommon. Tigers do not exist, but leopards and other species of the Felis tribe, hyænas, jackals, antelopes, including the hartebeeste, the eland, the bushbok, and the blesbok, are common. Thegnu is to be seen occasionally in the uplands. The chacma, a baboon, dwells in the mountains and kloofs. The ant-eater is frequently to be found. Among the birds are the South African vulture, several varieties of the eagle, the secretary-bird, the hawk, the crow, the Kaffir fink, the emerald cuckoo, the honey-guide, the kingfisher, bee-eater, partridge, pheasant, quail, pigeon, paauw or wild turkey, crane, stork, pelican, and small flamingo.

Among the native vegetable productions of Natal are the wild bananas, palms, euphorbias, Natal plum, Kaffir broom, the fire lily, the Natal lily, the hæmanthus, the calla, the Natal white arum, the aloe, earth-growing orchids, the leonotis, and mimosa. True grasses are very numerous. The yellow-wood, sneeze-wood, the stink-wood, the black iron-wood, white iron-wood, lance-wood, white pear-tree, white milk-wood, South African ash, saffron-wood, South African elder, are counted among the Natal timber-trees. The ferns are in great variety. The climate and soil of the coast islands of Natal are more or less favourable to the growth of plantation produce, such as sugar, coffee, arrowroot, spices, tobacco, cotton, flax, silk, and tropical fruits. As regards the cultivation and preparation for the market of sugar, which occupies the first position among the successful industries of the colony, the essential to a good return appears to be a careful choice of site, but the chief

difficulty is to obtain labour. This is being met, as far as possible, by the introduction of Eastern coolies. These were first brought to Natal in 1866, with the express intention of supplying suitable labour for the coast plantation industries, and in 1875 the importation of coolies from India was renewed. Many of those people, after their term of service has been completed, resort to the towns, where they become domestics. Maize is largely cultivated by the natives, and other grains yield a fair return. Rice is occasionally profitably grown. Many districts are favourable to sheep and cattle farming, but pleuro-pneumonia and red water often cause terrible destruction among the latter. Natal is less favourable to ostrich farming than the Cape.

The only harbour is that of Port Natal, in lat. 29° 30' S., a lovely and almost landlocked bay, containing generally from 15 to 20 feet of water, where vessels may ride in security. To facilitate trade, a breakwater has been built at the entrance of the harbour, to prevent the accumulation of sand, which interfered with the passage of vessels. It was constructed after the manner of the great breakwater at Portland, by driving in piles, carrying out a railway over the sea, and the dropping in hundreds of tons of stone from the trucks. On the north side of this inlet is the town of Durban, the seaport of the colony. In order to facilitate the communication with the coast from the county of Victoria, an iron girder bridge, about 1100 feet long, was built over the river Umgani (which was so deep and dangerous in the summer as to prove a formidable obstacle to traffic) in 1865. The structure was the most handsome of its kind in South Africa, and cost no less than £19,000. In August, 1868, it was unfortunately swept away by a violent flood, which inflicted great damage on both public and private property all around. Steps, however, were soon taken to replace the bridge, by means of which the principal communication with Victoria county was kept up. In 1888 there were 150 miles of railway constructed, and another 180 in course of construction in the direction of the Orange Free State. Durban is at present connected by rail with Pietermaritzburg, and with Verulam, and with the sugar district on the Tapingo River. The principal imports are haberdashery, iron goods, cottons, and woollens. The trade is chiefly with the mother country. The imports into the United Kingdom from Natal in 1886 were valued at £685,338, and the exports thence at £959,261.

The population is large for South Africa when compared with area; and if the natives would work with any regularity or industry, the field labour question would no longer be a difficulty. In 1887 the population was 430,000, out of which only about 25,000 were Europeans, and about 13,000 Indian, Chinese, and St. Helena immigrants. As a rule the Natal natives are barbarians; and yet, having for many years been protected by the British power, subjected to the personal rule of an officer of the colonial government, brought under a system of taxation, and accustomed to the ways of a settlement, having also been the objects of an active missionary agency, they are one degree removed from the savagery of their kindred who still rejoice in a freedom from European restraint. They are polygamists, believers in witchcraft, inclined to cruel practices, fond of a free, idle life, exact labour from their women, whom they consider to be a better sort of cattle, and wear but very scanty clothing. Physically they are a fine people; in disposition gay, and they are not without intelligence.

Natal is ruled under the British crown, represented since 1879 by a governor. Under the charter of constitution granted in 1866, and modified in 1875 and 1879, the governor is assisted in the administration of the colony by an executive and a legislative council. The executive council is composed of the chief justice, the senior officer in command of the troops, the colonial secretary, the trea-

suror, the attorney-general, the secretary for native affairs, and two members nominated by the governor from among the deputies elected to the legislative council. The legislative council, under an Act which received the royal assent in 1883, consists of thirty members, seven of whom are nominated by the crown, and the others elected by the counties and boroughs, electors being qualified by the possession of property of the value of £50, or rents from property of the annual value of £10. Special arrangements have been made to meet the legal ideas of the various races. Thus Roman-Dutch law, English imperial statute law, and native customary law, with special courts to apply each, play a part in the administration.

There are government high schools in Pietermaritzburg and Durban; there are also several government primary schools, and a large number of denominational aided schools, under government inspection, besides twelve Indian schools. The revenue is nearly £1,000,000 per annum. The public debt consists of six loans, mostly at 4, 4½, and 5 per cent. The total debt is about £3,000,000.

Natal was so named from having been discovered on Christmas Day, 1497, by Vasco da Gama, the celebrated Portuguese navigator. In 1760 the Dutch for a very short time had a trading settlement at the site of the present harbour of Durban, but it was speedily abandoned. In 1823 Lieutenant Farewell, R.N., attracted by the appearance of the country near the Bay of Natal, arranged for a settlement, and the natives readily granted a site for the little colony. Twenty years before there would not have been room for the newcomers, as at that time the land was thickly peopled. In 1810 the famous Zulu chief Chaka began his career of conquest. Marching southwards, he cleared the country before him of man and beast and left it a wilderness. In 1828 that chief was assassinated and succeeded by his brother Dingaan, who threatened the English settlers with hostilities on account of their continuing to receive those who had fled from the terrors of himself and his brother. In 1835, however, Captain Allen Gardiner brought about an agreement between the Zulu chief and the settlement.

In the year 1837 a large body of Dutch Boers, from the Cape Colony, taking offence at the restrictions placed upon them by the British, migrated to Natal, and they were welcomed by the English settlers; but a treacherous attack on them by the natives led to hostilities, and much slaughter followed. At length, in a great battle, the Dutch were victorious, Pietermaritzburg was founded, and many settled near the English encampment of Durban. By their aid Panda, a brother of the chief who had first attacked them, became supreme among the natives, and owing to the belief that the English had withdrawn their claims to the territory, they proclaimed the republic of Natalia. The English asserted their claims, and fighting began, which ended in the submission of the Dutch. In 1848 Natal was formally declared to be a British colony. Many of the Dutch, dissatisfied with the new arrangements, recrossed the Drakenberg. The year 1849 was remarkable for the arrival of a considerable body of British settlers. In 1858 the first Bishop of Natal was appointed in the person of Dr. Colenso. In 1856 a new governor brought with him a royal charter which made Natal independent of the Cape, and constituted a legislative council of twelve elected members and four official nominees. In 1873 the difficulty with Langalibalele occurred. That chief, having shown some signs of disobedience, fled with his people towards Basutoland. Being intercepted by a party of volunteers, some of his men fired with fatal effect, three of the volunteers being killed. A punishment followed, which was considered by the imperial government to have been unnecessarily severe, and the governor was recalled in 1875, Lord Wolseley administering the government for a while.

For long the great disproportion of the white to the

native population, and the ever-increasing horde of Zulu refugees who were left to themselves with their own savage laws and customs, had been felt to constitute serious dangers for the colony; and now that Ketsahwayo on the borders had formed a powerful state on a military basis, the danger was felt not only in Natal and the Transvaal, but even on the frontier of Cape Colony. The intrigues of the Zulu chief kept the native tribes in a constant state of dread or of hope. It was determined to break his power, and in 1879 the Zulu War broke out, marked by the disaster of Isandhlwana, the death of the Prince Imperial, and the victory of Ulundi. See ZULULAND.

**NATION** (Lat. *natus*, born) is a state or society united by common political institutions. The ideal nation would in addition to this be of one race, with homogeneous manners, customs, and affinities, speaking one language, holding one faith, and bound by every tie into one whole. Such a nation has never existed, except on the very smallest scale. The races of mankind have now become so intermixed that it is impossible to constitute separate nationalities out of the different races, ethnological divisions, or languages. In the present state of society many varieties of race are often included under one political government, with the happiest results. At the same time there is no doubt that highly composite states, hardly fairly to be called nations, such as Austria, Turkey, &c., which depend therefore merely on the political bond, are very much weaker than states of the same size (or even of less size), such as France or Germany, which are largely by race, as well as by law, one nation. And in making re-arrangements of the map of Europe, politicians who altogether disregard the principle of nationality in race, speech, and religion, find their artificial settlements crumble away as soon as they are made. Such a settlement was made by the consent of all the great powers of Europe, who divided Bulgaria in 1878, at the treaty of Berlin; so early, however, as 1885 the Turkish half threw off the imposed yoke and joined the free half.

**NATIONAL ASSEMBLY** (of France). See CONSTITUENT ASSEMBLY.

**NATIONAL CONVENTION.** See CONVENTION.

**NATIONAL DEBT.** The National Debt of a country consists of money borrowed from individuals under the authority of the legislature or government, and the security for which is all the property of the country. Most national debts are divided into a "funded" and unfunded or "floating" debt; the distinction between the two being that in the former case the government do not profess to repay it—they only give the creditor an annuity terminable or perpetual; and if he wants payment of his money, he can only get it by selling his right to this annuity. The floating debt, on the other hand, consists of temporary loans, liable to fluctuation, and renewed from time to time. The contracting of the English National Debt cannot be said to have begun before the Revolution of 1688. Even for some few years after the accession of William and Mary, the borrowings of the government were for short periods only. The first transaction of this kind of a permanent character arose out of the chartering of the Bank of England in 1693, when its capital of £1,200,000 was lent to the public at 8 per cent. interest. [See BANK.] A power of repayment was reserved by the crown, but there was no corresponding right of demanding payment on the part of the bank.

So cautious was the Parliament in those days of burdening future generations for the exigencies of the present moment, that when the annual income was inadequate to meet the charges of the foreign wars in which the country was engaged, and it became necessary to borrow the deficiency, annuities were granted, not in perpetuity, but for lives and terms of years, the produce of certain duties being mortgaged for their discharge.



This cautious proceeding could not be long continued. The expensiveness of the wars in which the nation was engaged at the end of the seventeenth century made it necessary to incur debts beyond the means of their prompt redemption, and at the peace of Ryswick, in 1697, the debt amounted to £21,500,000. During the next ten years, although the country was again involved in a continental war, its amount was reduced to little more than £16,000,000, and the greatest efforts were made to raise money without imposing any lasting burden on the people. These efforts, indeed, soon found their limit, and at the accession of George I. in 1714, the debt had accumulated to the amount of £54,000,000, an amount which excited great uneasiness, and caused the House of Commons to declare itself under the necessity of making efforts for its reduction. In 1717 the debt amounted to £18,500,000, and the annual charge in respect of the same to £3,117,296. A great part of this debt consisted of annuities granted for ninety-nine years, the money obtained for which had varied from fifteen to sixteen years' purchase.

In 1736 the public debt of England amounted to about £50,000,000, but the annual charge had been reduced below £2,000,000. At the peace of Aix-la-Chapelle, in 1748, the national debt exceeded £78,000,000, but in the following year the public obtained some relief from the burden through the lowering of the rate of interest. At the breaking out of the Seven Years' War, in 1756, the debt still amounted to £75,000,000. A public writer of some repute, Mr. S. Hannay, says, at that date, "It has been a generally received notion among political arithmeticians, that we may increase our debt to £100,000,000, but they acknowledge that it must then cease by the debtor becoming bankrupt."

When the Seven Years' War was ended by the peace of Paris, the debt reached £139,000,000, and the annual charge was £1,600,000. The war of American Independence raised the debt from £129,000,000 to £268,000,000, and the annual charge in respect of the same to £9,512,232. At the beginning of the war of the French Revolution the debt amounted to £260,000,000, and its annual charge to £9,437,862. But between 1793 and the peace of Amiens, the addition made to the capital of the debt amounted to £360,000,000, and the annual burden was increased from £9,437,862 to £19,945,624. Between the recommencement of the war in 1803, and its termination after the battle of Waterloo in 1815, there were added £420,000,000 to the capital of the debt, which then amounted, including the unfunded debt, to £885,000,000, and the annual charge upon the public exceeded £32,000,000. The debt has been created almost entirely by wars.

Since 1816 England's position has greatly improved as compared with other nations. In 1816 she owed £885,000,000 against £600,000,000, the united debt of all other countries; whilst in 1887 she owed £736,000,000, against nearly £5,000,000,000, the combined debts of other countries!

The progress in the reduction of the English debt will be better appreciated when it is remembered that the emancipation of slaves in our colonies in 1833 caused an increase in the debt of £20,000,000; the Irish Famine loan, a further £8,000,000; the Crimean War, about £35,000,000; the purchase of the Telegraphs, £10,000,000; and of the Suez Canal Shares in 1876, £3,300,000, making a total addition within recent years of £76,300,000. No special tax has ever been imposed for the reduction of the debt, which has been effected chiefly by sinking funds, terminable annuities, and the appropriation for the purpose of a certain portion of surplus revenue. In the six years from 1871 to 1876 the debt was in this way reduced by more than £25,500,000. The charge for interest, &c., of the national debt has been in recent years, and was in 1874, about £27,000,000. In 1875, however, a proposal of the

Chancellor of the Exchequer was adopted and became law, by which the regular charge for the national debt was fixed at £28,000,000 per annum, the portion of this in each year not actually required for interest being applied in reduction. An annually increasing sum is thus available for this purpose, the result being that the debt would be reduced in thirty years from 1875 by £162,000,000. The operation of the Act was, however, suspended for the year 1887-88.

The following table shows the total amount of the national debt of the United Kingdom at the end of each financial year, from 1871 to 1887:—

Financial Years ended 31st March.	Capital of Unredeemed Funded Debt.	Estimated Capital of Terminable Annuities.	Amount of Unfunded Debt.	Total Amount of National Debt.
£	£	£	£	£
1871	732,043,270	51,050,106	6,091,000	789,184,466
1872	731,766,962	49,018,769	5,158,100	785,925,831
1873	727,874,082	47,018,928	4,829,100	779,722,110
1874	723,514,005	44,941,388	4,471,600	772,934,934
1875	714,787,715	43,808,742	5,230,300	768,545,757
1876	713,657,517	43,847,966	11,401,800	770,506,683
1877	712,621,355	43,449,568	13,943,800	770,014,723
1878	710,843,007	40,708,718	20,608,000	772,151,725
1879	709,430,593	37,684,369	25,870,100	772,985,062
1880	710,476,359	33,784,649	22,344,900	771,606,908
1881	709,078,528	34,968,435	22,077,500	766,144,461
1882	*709,489,547	33,181,875	*18,007,700	760,698,122
1883	*712,698,994	27,570,876	*14,185,400	754,455,270
1884	†640,631,095	†91,082,269	14,110,600	746,423,964
1885	640,181,696	86,115,658	14,033,100	740,330,654
1886	638,849,694	85,829,917	17,602,800	742,282,411
1887	637,637,640	81,128,148	17,517,900	736,278,688

Under the National Debt Act, 1881, bonds amounting to £7,750,000 were converted into £8,603,006 stock.

† Including outstanding exchequer bonds issued for raising money for the purchase of Suez Canal shares. In 1885 these amounted to £3,439,300.

‡ Including £1,000,000 borrowed in aid of ways and means.

§ In the course of the financial year 1883-84 £70,241,908 three per cent. stock was converted into terminable annuities under the provisions of the National Debt Act, 1883.

The public debt of the various nations of the world, according to the latest returns, will be found under the headings of the several countries; but it may be useful here to present a summary of the most important in Europe, according to the latest returns. France, of course, takes the lead, the war and indemnity having added about £400,000,000 to the debt since 1870:—

	National Debt.	Interest.
£	£	£
Austria, . . . . .	474,759,955	21,373,063
Belgium, . . . . .	72,222,665	4,125,143
Denmark, . . . . .	10,544,440	500,000
France, . . . . .	900,000,000	47,000,000
German States, . . . . .	297,466,400	13,348,480
Great Britain and Ireland, . . . . .	740,330,654	28,000,000
Greece, . . . . .	18,801,395	875,725
Holland, . . . . .	78,442,870	2,706,000
Italy, . . . . .	446,502,440	20,000,000
Luxembourg, . . . . .	600,000	24,000
Montenegro, . . . . .	170,000	8,500
Norway, . . . . .	5,964,968	270,000
Portugal, . . . . .	97,512,000	2,901,850
Roumania, . . . . .	27,782,110	1,933,887
Russia, . . . . .	683,000,000	28,440,022
Servia, . . . . .	5,500,000	310,000
Spain, . . . . .	240,000,600	10,750,000
Sweden, . . . . .	12,719,525	599,388
Switzerland, . . . . .	1,340,000	77,294
Turkey, including Bulgaria and Eastern Roumelia, but not the Asian and African provinces, . . . . .	149,687,434	12,237,560
	4,217,527,388	195,462,101

To show the entire indebtedness of the various nations of the world, we should add at least £800,000,000 for the United States, India, Australia, Canada, Cape Colony, Brazil, and other South American States, making the total



of over £5,000,000,000! and this without including municipal or other local debts. The United Kingdom is the only nation which owed less in 1885 than it did in 1850. The total liabilities of all nations in the latter year amounted to only £1,700,000,000, so that upwards of £3,300,000,000 have been borrowed in the last thirty-five years.

**NATIONAL GALLERY.** See LONDON.

**NAT'ROLITE.** See ZKOLITE.

**NATTER-JACK.** See TOAD.

**NATURAL**, a musical character, thus formed— $\sharp$ , the use of which is, to make a previously sharpened note a semitone lower, or a previously flattened note a semitone higher; also, it serves to elevate accidentally any note of the key which is flattened by a key-signature in flats, or to depress accidentally one which is sharpened by a key-signature in sharps. The article ACCIDENTALS gives the curious history of the sign.

**NATURAL HISTORY**, in its true sense, means the history of nature or of natural objects. It would first concern itself with the history of the universe—how the stars, sun, planets, &c., came into being, their composition, laws, &c. The science would then proceed to discuss our own earth more minutely, as it is possible to examine it in greater detail; its history would be given from its birth, when it was separated from the solar mass, then the gradual cooling and formation of a crust, until it was possible for living objects to appear upon it. This would bring us from astronomy to geology, which investigates the changes that the surface of the earth has undergone. In order to do this, geological science proceeds to discover the composition of rocks, the natural forces which are at work in elevating, disintegrating them, &c.; and as an aid in the determination of the succession of rocks, geology is very largely concerned with the study of the remains of living objects now found fossil in the rocks. Thus mineralogy, physics, paleontology are subsidiary sciences to geology. And now natural history would approach higher ground and take up the study of living beings (biology) in the two great divisions of plants (botany) and of animals (zoology). Formerly, the amount of knowledge of natural objects was so small that individuals could grasp the whole; but the number of facts has increased so enormously, especially of late years, that men now are obliged to restrict themselves to some special branch. So, too, as the various branches of natural history have received special names, such as astronomy, geology, the term natural history has gradually come to be identified with the most important branch, namely, the study of animals.

**NATURAL SELECTION.** See EVOLUTION.

**NATURAL SEVENTH**, often called the subminor Seventh, the note in the ratio of four to seven from the lower keynote, or seven to eight from the upper. It is not used in our music, its near neighbour, the minor Third of the dominant being used in the scale instead. See SEVENTH.

**NATURALISM**, in art, is the pursuit and study of Nature herself as distinguished from culture according to set rules and methods. The epithet was first applied in art to the modern Dutch school, as a reproach to them for being deficient in idealism. It may or may not have been deserved, but what is certain is that the most careful naturalism is perfectly compatible with the most intense idealism. The truest portrait painter of our day is at the same time the greatest idealist. In fact the Horatian maxim serves here as always, "In medio tutissimus ibis."

Naturalism alone is as dull as classicism alone is stilted; but genius can express itself in either of these two ways. The romantic schools of art, relying upon nature as seen by the illumination of genius, periodically overthrow the classical schools wherein genius expresses itself in fetters according to rule; but in the revenge of time they themselves become in after years the models for a new classi-

cism. Thus in literature Victor Hugo in France and Byron in England, or again, in music Berlioz and Wagner, men whose whole lives were one long conflict against the established order, are now held up as models, and have their crowds of imitators. The consequent reaction in France is very curious as to literature. Tired of the classical view of art by itself, and satiated now with the romantic view of nature seen through art, an important school of naturalists, pure and simple, has firmly established itself. Everything is set down as exactly as possible, the aim being to give a photograph and not a picture—a crowd of actual facts unilluminated by any idealism. The result is so dull, that in order to give their books colour the naturalists, whose leader is M. Zola, take their subjects deliberately from the lowest vices and crimes.

Naturalism in philosophy is the effort made by some of the greatest ancient philosophers to derive everything from natural causes. As Epicurus puts it, they ought to show that the intervention of the gods was unnecessary for the explanation of phenomena. It was a protest against the prevailing religious teaching of those times which ascribed every storm to the anger of Zeus, every shipwreck to the ill-will of Poseidon. This must not be confused with materialism, into which in weaker hands it degenerated. It is manifestly impossible to have any reasonable philosophy whatever except upon the lines of naturalism, that is, an acknowledgment of the supremacy of the established order of nature. The question, who arranges and maintains that established order, is another matter; and the most thoroughgoing naturalist in philosophy may be, and usually is, at the same time a deeply religious man.

**NATURALIZATION** (Lat. *naturalis*, natural). "If an alien be naturalized," says Coke (Co. Lit., 129, a), "he shall be to all intents as a natural subject, and shall inherit as if he had been born within the king's allegiance."

Formerly there could be no naturalization except by special Act of Parliament; but the Naturalization Act of 1870 greatly simplified the proceedings, and made some important alteration in the law relating to aliens. The person wishing to be naturalized presents a petition to the secretary of state (who has a discretionary power in every case), praying he may be admitted to the privileges of a British-born subject, and stating, among other particulars, that during five of the preceding eight years he has resided within the United Kingdom, or has served five years under the crown. He must make a declaration before a magistrate or other properly-qualified person verifying the statements in the petition, and a declaration must also be made and signed by four householders, who must vouch for the respectability and loyalty of the memorialist, and verify the particulars in his memorial. The applicant must also make a declaration of his intention to continue his residence in the United Kingdom or to remain in the service of the crown; and also to divest himself of his former nationality, and to take the oath of allegiance. See ALIEN.

**NATURE-WORSHIP**, the adoration of natural objects—stones, trees, animals, &c.

**NAUKRATIS** (or *Naukratitia*), a city of Sais, in the Delta of Egypt, on the Kanôpîc branch of the Nile, said by Herodotus to be founded by Greeks from Milêtos about 550 B.C. It always remained purely Greek, and was long the only port open to Greek trade. Its temples of Aphroditê were very famous, and later it became notorious as a place of pleasure. Athenaios and other distinguished Greek authors were born here.

In 1885 Mr. W. M. Flinders Petrie, in some extensive excavations on the site of Naukratîs, placed it beyond a doubt that the Greek colony in Egypt was much older. The Greeks indeed seem to have been settled there possibly as early as 700 B.C., and the gift of the city to Greeks by Amasis in 550, as spoken of by Herodotus, was

doubtless rather a confirmation or extension of charter. Mr. Petrie exposed the sites of the temples mentioned by Herodotus, and votive tablets fixed their purpose with additional accuracy. "Phanes dedicated me to Apollo of Milêtos," says one. Below these temples of the grand period lie older temples, placed at about 400 B.C.; one of them has marble walls, richly coloured in red and blue. The date is given by the votive scarabs or beetle-shaped stones, on which is engraved the "cartouche" of the reigning king. The discovery is of vast importance, since it settles numbers of questions of Greek archaeology. For instance, the relics of writing and of iron give a far earlier date to those arts than has hitherto been agreed. A written Homer may have therefore existed before 800 B.C., for the writing at Naukratis of 700 B.C. is of advanced style, very perfectly developed. The pieces of pottery, of many various well-fixed dates, are of incalculable value and interest, and the inscriptions thus preserved are counted by hundreds.

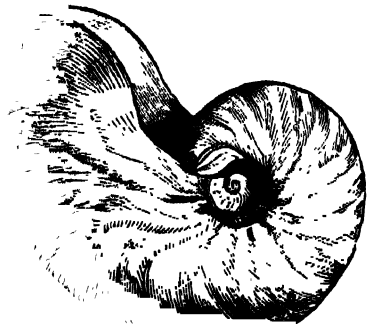
**NAUMACH'IA**, the representation of a sea-fight among the Romans, which was sometimes performed in the Circus Maximus or amphitheatre, water being introduced sufficient to float ships, but more frequently in places made especially for the purpose, which were called Naumachie. In a Naumachia of Titus 8000 men were engaged.

**NAU'PLIA**, a town of the Morea, built on a rocky promontory at the north-east extremity of the Argolic Gulf. It is inclosed by strong Venetian fortifications, with several batteries, and has two fortresses; and its roadstead is one of the best in Greece. Nauplia was occupied by the Venetians in the thirteenth century, and became their chief settlement in the Morea, until it was taken from them by Sultan Solymán in 1537. After the Greek insurrection it remained for several years the head town of Greece, until it was superseded by Athens. Its population, which had risen to about 12,000, then declined, and is now not more than 4000. The streets are irregular and dirty, and the air is not wholesome. The Greek bishop is styled Bishop of Argos and Anapli. An aqueduct of good water from the rocky ridge near Tiryns supplies the town.

**NAUTILUS** is a genus of molluscs belonging to the CEPHALOPODA, and the only living representative of the Tetrabranchiata, one of the two orders into which that class is divided. The Pearly Nautilus (*Nautilus pompilius*) was known to Aristotle, as well as the Paper Nautilus or ARGONAUT (*Argonauta argo*), which is a very distinct form, allied to the cuttle-fishes.

The Pearly Nautilus is remarkable among living cephalopods for the possession of an external discoidal, many chambered shell. The chambers are formed successively by the animal slipping forward in its shell and forming a septum behind it. A connection is maintained between the animal and the oldest chamber, that is, the chamber which constituted the entire shell of the young nautilus, by a small membranous process—the siphuncle—which pierces the successive septa. The significance of the siphuncle is open to question, for the animal is maintained in its shell by other means. During the life of the animal the deserted chambers are said to be filled with a gas which serves to lessen its specific gravity. In the nautilus the foot completely embraces the head. Surrounding the mouth are a great number of tentacles retractile within sheaths; these appear to correspond morphologically to the suckers on the arms of cuttle-fish and other cephalopods. The female nautilus has ninety of these tentacles; the male has only fifty-eight, four of which on the left side are modified to form the "spadix," an organ analogous to the hectocotylized arm of the argonaut. In addition there are two ocular tentacles on each side of the eye. The mouth is of the usual cephalopodous character, consisting of two horny mandibles like a parrot's beak,

which, however, are calcified to a considerable extent; the eye is remarkably simple, being without a lens, and open by an aperture on its surface to the sea-water. There are four branchiæ or gills, and four kidneys. The nautilus, like other cephalopods, swims backwards by ejecting water from its siphon. The capacious crop or oesophagus leads into a very muscular stomach, resembling the gizzard of birds; the intestine is nearly straight and terminates in the branchial cavity. The nautilus is an inhabitant of the



Shell of Umbilicated Nautilus.

Indian and Pacific Oceans. It is essentially a deep-sea form, living on the bottom of the sea and feeding on molluscs, crabs, and other crustaceans. The shell of the pearly nautilus is on the outside whitish with streaks and bands of fawn colour, and the inside has a beautiful pearly lustre. The Umbilicated Nautilus (*Nautilus umbilicatus*) has been made a distinct species upon some minor differences in the shell. The extinct allies of nautilus were numerous in the Palæozoic and Secondary ages. See AMMONITES; BACULITES.

**NAVARRINO**, called *Neocastro* by the Greeks, a small town and fortress of the Morea, built on the south coast of the Bay of Navarino, about 5 miles N. of Modon, and about 8 from Old Navarino, which is a ruined town with an old fort built on a steep hill on the northern coast of the bay, near the site of the Messenian Pylos. The island of Sphacteria, or Sphagia, lies across the entrance of the bay, and adds to its security, rendering it one of the best harbours in the Levant. It is famous in antiquity for a total defeat of the Spartans by the Athenian navy. In modern times the Bay of Navarino has become memorable for the naval battle which took place 20th October, 1827, between the French, English, and Russian combined fleets on one side, and the Turco-Egyptian fleet on the other. This battle, which ended in the complete defeat of the Ottomans, decided the independence of Greece.

**NAVARRA** (*Navarre*), a province of Spain, formerly with the title of *Kingdom*, is bounded N. by France and the Mediterranean, E. by Aragon, S.E. by Saragoza, S.W. by Logroño and N.W. by the Biscayan provinces. The total area is 4042 square miles, and the population at the last census was 804,184.

Three-fourths of the surface of Navarra are mountainous; the remaining fourth consists of a few large valleys and some small fertile plains. The Pyrenees, which form the northern boundary, send off numerous other chains, which gradually decrease in height as they approach the south. The loftiest summit of these mountains, Altobiscar, is about 5400 feet above the level of the sea. That part of the province which borders on France is very rugged, barren, and thinly peopled, excepting the valleys of Baztan, San-tisteven de Lerin, and the Cinco Villas de Navarra.

The principal rivers are the Ebro, and its tributaries from the left bank, the Ega, the Arga, and the Aragon,

which last receives the Irati, the Salazar, and the Esea. The extreme north of the province is watered by the Bidasoa. The climate of the northern districts is cold in winter, and rarely subject to excessive heat in summer; in the south it is far more genial and salubrious. The principal valleys are, BAZTAN; Roncesvalles, renowned in history for the defeat of Charlemagne in 778; and those of Lescou, Roncal, Baigorri, Salazar, and Aezcoa; the roads which traverse the province itself are excellent.

The mountains are mostly of transition and secondary rocks; jasper and marble are found. There are many mines of iron and one of copper; one also of rock-salt near Valtierra, and several hot springs. The principal forest trees are the pine, the oak, the olive, the chestnut, the beech, and the box. The most important agricultural products are wheat, maize, barley, oats, rye, spelt-wheat, chestnuts, beans, hemp, flax, olive oil, and excellent wine.

Navarra contains great numbers of horned cattle, sheep, goats, pigs, and mules. The mountains abound in game and the rivers in fish. The wild animals are wolves, foxes, and wild boars, and in many of the mountainous districts the inhabitants follow the chase as much from necessity as inclination. Owing to the proximity of the province to France, and the dangerous character of the almost inaccessible mountain passes, which alone connect the two countries, very many of the inhabitants are engaged in smuggling. They have always intermarried among themselves, and are consequently a nearly pure Basque race. Although not industrious the people manufacture small quantities of glass, leather, soap, chocolate, &c. of good quality. The capital is Pamplona.

Navarra, which was never completely subjugated by the Arabs, formed a distinct kingdom at the end of the ninth century, and was united to Aragon from 1076 to 1134. The kings of France held it for a short time at the end of the thirteenth century. It was taken by Ferdinand the Catholic in 1512, and united to Spain. A small part of the country, called Basse Navarre, remained to Catharins of Navarre, and was united to the French crown in 1589. From that time till 1830 the kings of France assumed the title of kings of Navarre. In the civil strife of 1874 Navarra took the Carlist side, and the siege and capture of Estella, with the death of Marshal Concha, were among the chief incidents of the struggle.

**NAVE**, the principal body of a church, so called from its resemblance to an inverted ship (Lat. *navis*); so that the Germans name it *schiff*, and the French *nef* (each of them native words for ship), to this day. The groining of the roof served for the ribs of the imaginary boat, and the pillars for the masts, in the fancy of the people; and this fancy, of course, took its origin in the likeness of the church of Christ, amid an unbelieving and often hostile barbarism, to a stout ship floating on a treacherous ocean. The nave extends from the great western door to the chancel or choir in an unbroken length; it is crossed by the transepts, if there are any, and is accompanied lengthwise by the aisles on one or both sides. The origin of the nave and aisles is shown in the article **BASILICA**, and its connection with the parts of our grand mediæval churches is more clearly seen in the article and Plates of **ENGLISH CATHEDRAL ARCHITECTURE**.

**NAVIES, ANCIENT AND MEDIEVAL.** The earliest nations to fit out ships of war seem to have been the Phœnicians, Carthaginians, Persians, and Greeks, and the first use of these vessels was to protect commerce from piracy. As early as the beginning of the seventh century B.C. the Greek states had fitted out fleets of war ships, and a naval battle is recorded as having taken place between the Corinthians and their colonies of Coreyra, 664 B.C., in which triremes were employed. There are many references to merchant ships in the Old Testament, and in Dan. xi. 30, 40, there are allusions to ships of war and their influence

on national disputes, similar references being found in the apocryphal books of the Maccabees (1 Macc. viii. 26-28, &c.) The battle of Salamis, 480 B.C., between 800 Greek ships under the command of Themistoklēs and 1000 Persian vessels, is one of the memorable battles of the world, and it is also one of the first recorded in which tactical skill triumphed over a vastly superior force. The attention bestowed upon the navy by the Greeks, and the valour and prowess of their sailors, gave them for a time a commanding position in the Mediterranean, but the supremacy passed from them to the Carthaginians, and the latter in their turn had to yield to the all-conquering Romans. The old ships of war were furnished with sails and oars, and they were built with a strong pointed prow or beak for ramming an enemy, but the mode of fighting chiefly practised was that of running alongside and after a preliminary discharge of arrows and javelins coming to close quarters. Close-quarter fighting was especially favoured by the Romans, and their ships were furnished with grappling irons to lay hold of an enemy's vessel, and had towers erected upon their decks for archers and slingers. The largest vessels of the Greeks appear to have been manned by about 200 sailors and fighting men, and the Roman vessels carried 120 fighting men in addition to the oarsmen and sailors. For the attack of fortified ports, balistæ and other missile engines were sometimes carried upon ships, but they were very little relied on for purely naval engagements. As the power of the Roman Empire declined, piracy became very common, and the hardy Norsemen and ferocious Moors in their swift-sailing galleys became a terror not only to traders upon the seas of Europe, but also to the inhabitants of the coast towns everywhere. For the suppression of these marauders in the Mediterranean, the states of Venice, Genoa, and Aragon fitted out fleets of galleys, and similar measures were adopted by England and France for the northern seas. In the Mediterranean there were many fierce and prolonged struggles for supremacy between the maritime states, but the first place was ultimately taken by the Venetians by the beginning of the fifteenth century. The discoveries of the Cape route to India and of the American continent were fatal to the naval predominance of the Venetians, and Spain became for a time the greatest naval power, though it had a formidable rival in Portugal. On the downfall of Spain as a maritime power, the struggle for the first place was left to France, England, and the Low Countries, and after being waged with varying success for a long period, it resulted in favour of England, which from the middle of the eighteenth century to the present day has been the first naval power of the world. See **NAVY, BRITISH**.

**NAVIGATION.** The earliest use of ships on an extended scale is the semi-historical Greek fleet which conveyed the Hellenes to the siege of Troy. Even if the details are due chiefly to the imagination of Homer, these details show us the art of navigation as it existed in his day, which is of itself of very great antiquity. The ships were by no means mere boats, for many of them, as the second Iliad recounts, carried 120 soldiers. Neither did they depend altogether upon rowers, for we know how the fleet was delayed long at Aulis by contrary winds; but at the same time the wind was rather considered as an assistance than as the chief motive power. These ships, Homer tells us, had a movable mast, stayed fore and aft (not on each side as with ourselves), and a large sail; they were not decked, but quite hollow, and were pitched black, with red streaks or ornaments. On arrival at the shores of Asia, the ships were hauled up on the beach by their sterns, and fastened with ropes to huge stones to keep them fast. This was ever the practice of the ancients, and every school-boy delights in the account the great Julius Cæsar gives of the tide on the British coasts (to which as a Mediterranean commander he was unaccustomed), which rose in

the night and washed all his ships afloat, to his considerable danger.

At an early date, though much later than Homer's time, *biremes*, ships with two banks of oars, were invented; and the great war-ship of antiquity, the *TRIREME*, is attributed to Ameinoklès of Corinth, about B.C. 700. But at first the trireme was ill arranged, and a far swifter, more manageable and more dangerous vessel was the *Pentékontoros*, the fifty-oared ship, twenty-five rowers on each side. Themistoklès brought the trireme into prominence, and with it founded the supremacy of Athens at sea. But the ships were not decked, and were of slight construction. The Greeks hardly ever ventured out of sight of land—the coast by day, the stars by night served to guide them. In winter navigation ceased altogether. By the time of Alexander, about B.C. 300, the great *Quadriremes* and *Quinquereemes* were used; and the Punic War between Rome and Carthage was carried on chiefly with the latter (B.C. 260). Towards the end of the republic, the Romans increased the size of their ships to six, and even to ten tiers of oars on each side; and an account remains of Ptolemy Philopator, king of Egypt, having built a huge ship with forty ranks of oars.

The Phœnicians were the great navigators of antiquity, and their inducement to embark on the dangerous trackless sea appears to have been simply commercial gain. Their fleets covered the Mediterranean, and Carthage, their chief colony, sent its ships to Britain for tin. The sun and stars formed the sole guides of these determined mariners. About B.C. 450 Hanno sailed between the Pillars of Héraklès (Straits of Gibraltar) on a voyage of discovery; and he was much puzzled by the changed direction of the sun as he coasted round the shores of Africa. It was more than a century later before Nearchos, one of Alexander's commanders, accomplished in B.C. 325 his successful voyage with the Greek fleet from the mouth of the Indus to the Persian Gulf. But the Greeks, with Alexandria as their chief naval centre, soon quite eclipsed the Phœnicians in their skill in navigation. The Romans made no great advances upon the methods already discovered, but their extended colonization introduced good models to distant countries, and these were greedily acquired. The hardy men of the North, long accustomed to brave fierce storms in mere cockle-shells of boats made of osiers or pliable branches covered with hides, &c., advanced apace as soon as they learned how to build a galley and a ship. By 300 the British seamen were strong enough to defy the Roman power, and support the usurping Emperor Carausius in these islands, but, brave as they were, they had in turn to give way before the still greater sea-power of the English races from Denmark and the shores of the Elbe. The Norse nations also sprang rapidly to the front, colonizing Iceland, Greenland, Newfoundland, descending often upon England and France, and penetrating to the Mediterranean, where they founded considerable colonies in Sicily and elsewhere. Still the sun and the stars were the guides of the sailor, when the coast-line was not visible. It was not till the fifteenth century that the compass was well known in Europe. Marco Polo brought it from China in 1260, where it had been known (they say) for 2000 years; and about half a century later, a navigator of Amalfi, Flavio Gioja, discovered the present method of suspension of the needle. Columbus was able by help of this new power to undertake his memorable voyage, in 1492, and Vasco da Gama sailed round Good Hope in 1497. Columbus discovered the variation of the compass on his American voyage. Again the improvement of the south was seized upon by the north, and the hardy race of Englishmen, under the Tudor princes of England, carried our flag to all quarters of the globe. The compass box and hanging compass, much as now in use, was the invention of an Englishman, the Rev. W. Barlowe, in 1608.

In the early part of the sixteenth century the longitude was usually found at night by the "cross staff," a hinged or centred staff which could readily be arranged to take the angle between the moon and any fixed star; and the progress of astronomy soon provided ample tables of declination and right ascension to assist this operation. The Portuguese Nuñez proved that the oblique rhomb lines are spiral, and discovered great-circle sailing, towards the middle of the century (1547), and in 1545 the first definite treatises on navigation by Cortes appeared in Spain, rapidly being translated into all languages. The log is first mentioned in the greatly improved treatise on navigation of Bourne, an Englishman, in 1577. Mercator's chart was published in 1599, and Davis invented the quadrant about 1600. Logarithms, discovered by Napier (and improved by Briggs) about 1614, were immediately applied to navigation by Gunter in 1620. Almost contemporary with this was the invention of middle latitude sailing; and Norwood's measurement of a degree on the meridian, following close afterwards (1635), was embodied in his "*Seaman's Practice*" (1637). Hadley's sextant, by defining the latitude with readiness, marks the great advance in the next century (1730), and the enormous improvements in chronometers by the famous Harrison (1759), completed the practical equipment of the navigator, by enabling him easily and accurately to prove the longitude.

The *Nautical Almanac*, a miracle of exactness in astronomical matters, was first published in 1767, and has always since maintained its supremacy. The preparation of tables for this great work is one of the chief duties of the Royal Observatory at Greenwich, presided over by the astronomer-royal, and no pains are thought too great to be expended upon it.

**NAVIGATOR** or **SAMO'A ISLANDS** are a group of islands situated in the Pacific, on the trade route between New Zealand and San Francisco, between 1200 and 1400 miles from Auckland and Brisbane. The group contains nine inhabited islands, the four principal ones being Savaii, Mauna, Tutuila, and Upolu. The first-named is the largest, and covers about 700 square miles, the total area of the group being 2600. Although lying wholly within the tropics, between 18° and 15° S. of the equator, the climate is temperate, much of the land being high; and as the soil is largely composed of the *débris* of volcanic rock it is highly productive. Thick forests of bread-fruit, cocoa-nut, banana, and palm cover a large portion of the surface, besides which orange, lemon, pine-apple, sweet potato, yams, nutmeg, and sugar-cane grow luxuriantly. The population is supposed to number between 50,000 and 60,000. The port of Pago-Pago is one of the best coaling stations in the South Pacific. The trade of the group is chiefly in the hands of the trading firm of Godeffroy and Co. of Hamburg, "the South Sea-kings," as they are called, who have for many years past been attempting the colonization of the high temperate plateau in the principal island by German settlers.

**NAVIVUS, ATTUS.** See **ATTUS**.

**NAVY AGENT.** See **AGENT, NAVY**.

**NAVY, BRITISH.** The beginnings of the British navy are usually traced back to the time of Alfred the Great, who organized a fleet for the defence of the coast, which he sometimes commanded himself in battle, and with which he several times defeated the Danes. By his directions powerful galleys were built, some of which could not be rowed by less than thirty pairs of oars, and he carried into his naval administration that far-seeing sagacity which he displayed in every branch of his policy as well as in every crisis of his reign. His policy was sustained by his successors, and Edgar maintained efficient fleets both on the eastern, western, and southern coasts. William I. in 1066 established the Cinque Ports, endowing them with valuable privileges on condition that they should place at

the disposal of the crown, in case of foreign war, fifty-two ships carrying twenty-four men each. It was the custom, also, at any critical moment for the great landowners and rich towns to increase this small force by equipping ships at their own cost, manning them, victualling them, and maintaining them in an efficient condition while at sea. The king in addition claimed the right in times of need to arrest ships for his service, and to press mariners into them. When Richard I. started on his crusading expedition he took with him no less than 100 large ships and fifty galleys, while John is said to have fitted out 500 ships, in 1213, against Philip of France. John claimed for England the sovereignty of the seas, and demanded that the ships of other nations should always strike to the English flag—a claim which, after being the cause of some sanguinary conflicts, was formally ceded by the Dutch in 1678 and the French in 1704, and though not advanced in the present day, is yet remembered in the custom by which foreign vessels are required to salute *first*. Victories at sea were common enough under our Plantagenet kings. In 1293, in the reign of Edward I., a battle took place in mid-channel between the French and English fleets, ending in the total defeat of the former with a loss of about 240 ships. In 1340 Edward III. and the Black Prince, at the head of the English fleet, won a great victory over a very superior French force off Sluys. This action is said to have been one of the most desperate sea-fights ever known, and the loss of the French is set down by the old chroniclers at 200 ships and 30,000 men. During the next reign the power of the navy greatly declined, but it was revived in the reigns of Henry IV. and Henry V., the latter monarch being able at one time to collect vessels enough to transport 25,000 men into Normandy. Yet the royal navy had no permanent existence until the reign of Henry VII., who caused to be constructed in 1488, a three-masted ship, called the *Great Harry*—the earliest war-vessel of any size—afterwards accidentally burnt at Woolwich in 1553. Henry VIII. laboured hard at the formation of a regular navy, building several large vessels, especially the *Henry Grace de Dieu*, of 80 guns and 1000 tons burden, which was manned by 700 men. He also established dockyards at Deptford, Woolwich, and Portsmouth; created an admiralty and navy board, and divided the *personnel* of the navy into admirals, vice-admirals, captains, and seamen. At his death there were fifty ships in the royal navy, manned by about 8000 men. During the reign of Mary the tonnage of the navy was reduced, but the period will ever be memorable from the action taken by the lord high admiral, when he compelled the Spanish fleet, which had on board Philip of Spain on his way to marry Queen Mary, to strike colours and lower topsails as a homage to the English flag. The attention of Elizabeth was early directed to the importance of a powerful naval force, and though her parsimony at times seriously interfered with its efficiency, her efforts on the whole fully justified the title bestowed upon her of the Restorer of the Naval Power of England. The whole fleet collected to oppose the so-called Invincible Armada consisted of 181 ships, with 17,472 men; but most of these had been hastily equipped at the cost of the aristocracy and great cities, the number actually belonging to the royal navy being only 84 ships of 12,190 tons, carrying 6225 men. A description of the memorable conflict between the two fleets is given in the article ARMADA. At the end of the reign of Elizabeth, the navy consisted of 42 ships of various descriptions amounting to 17,000 tons, and manned with 8346 men. Under James I. and Charles I. the eminent naval architect, Phineas Pett, greatly improved the construction of the ships of war, and built a number of vessels which were at once swifter, more manageable, and more effective than any which had preceded them. Of these the most celebrated was the *Sovereign of the Seas*, of 1687 tons and 100 guns, which after a brave

fighting career was rebuilt in 1681, and accidentally burned at Chatham in 1696.

The ships of the royal navy appear to have been first classified into rates in 1626, when Charles I. issued the "new rates for seamen's monthly wages, according to his Majesty's several rates of ships and degrees of officers." They were six in number, the first being from 100 to 60 guns. According to Pepys, the first *frigate* built in England was the *Constant Warwick* (1619), launched by Peter Pett (the son of Phineas), as a privateer for the Earl of Warwick, and modelled from a French frigate which had visited the Thames. The French had adopted the mode from the Italians, but made use of it only for merchant vessels.

When the Civil War broke out Prince Rupert carried off twenty-five large vessels from the royal navy, and Cromwell, on his accession to supreme power, found it reduced to fourteen two-deckers and some smaller craft. That great ruler, ably assisted by energetic administrators, raised it in five years from this position of impotence to a height of power which it had never before reached. Under Blake, Penn, Lawson, and other admirals, some fierce naval battles were fought with the Dutch, and the English fleet fully vindicated the national claim to the sovereignty of the seas. At the instigation of Cromwell Parliament appropriated £400,000 a year to the service of the navy, and the fleet which crushed Van Tromp in 1653 numbered 105 men-of-war, carrying 3818 guns and 16,269 men. Charles II. diverted the money designed for the use of the navy to his own purposes, so that during his reign the Dutch were enabled to take possession of the Medway and ravage the English coast, while the unpaid English sailors were starving in the streets, and the few English ships, destitute of stores and ammunition, were unable to effect anything. Under James II. the royal navy was greatly improved both in *personnel* and *matériel*, and the admiralty was organized much on the same plan as still prevails. At the time of his abdication the list of the navy amounted to 173 sail, of 101,812 tons, carrying 6930 guns and 42,000 seamen. William III. did not neglect this most important interest, and at his death the navy consisted of 272 ships, measuring 159,020 tons, the ships of the line numbering 130. During the two succeeding reigns the naval strength of the country was maintained at about the same rate, but under George II. the size of the ships of the line was greatly increased, while many powerful vessels were captured from Spain and France and added to the English navy. In 1760, the year of the king's decease, the British navy included 412 ships, of 321,104 tons; but the wars of the next reign caused immense additions to be made to it, and at the peace of Amiens the list of the fleet amounted to upwards of 700 sail, of which 144 were of the line. During the revolutionary wars vast exertions were made to organize the English fleet on so grand a basis that it might maintain the supremacy of the seas against all comers. In 1800 it consisted of 757 ships, of 629,211 tons, but in 1810 these numbers had been left far behind, and the naval force consisted of 1048 ships, of 860,990 tons, carrying 140,000 seamen. Of course this list included a large number of non-effective ships, but from 1808 to 1813 there were seldom less than from 100 to 106 sail of the line in commission, and from 130 to 160 frigates, with upwards of 200 sloops, besides smaller vessels. After the fall of Napoleon the government still maintained a formidable fleet numerically, but in the build of the ships and the quality of the artillery they allowed England to be outstripped by other powers. In 1841 a gradual substitution of steam for sailing vessels began, and a number of paddle-wheel steam frigates were constructed. These were, however, soon superseded by screw steamers, and at the outbreak of the Russian War in 1854 Great Britain was in possession of a powerful steam fleet. Owing, however, to the development of shell fire the ships were unable to cope with the land

fortifications, and it became necessary to defend them with iron plates. As usual, the British admiralty left it to others to take the lead, and the use of armour was introduced by the French, who launched, early in 1855, five floating batteries, defended by iron plates  $4\frac{3}{4}$  inches thick, with a backing of 8 inches of oak. The example of the French was followed by the British administrators, and when the former commenced to arm the frigate *La Gloire* in the same way, they determined to build the *Warrior*, an iron ship defended by iron plates  $4\frac{3}{4}$  inches thick, which were then able to withstand the heaviest gun of the day. *La Gloire* was launched in 1859, and the *Warrior* in 1860, and the success of the new vessels was such as to intimate to the maritime nations of the world that a reconstruction of their fleets had become necessary. Since that date some of the finest mechanical skill at the disposal of civilization has been devoted, on the one hand, to the construction of armoured ships capable of resisting the heaviest ordnance, and on the other hand to the designing and forging of guns of such calibre and power as to be able to pierce the thickest plates that can be carried. Authorities are not agreed as to which side has gained the victory, for although the guns now made of 100 or 110 tons each are theoretically capable of piercing the strongest steel-faced plates that have yet been mounted, it is well known that the conditions of target practice can hardly ever be realized in actual warfare, and in the few engagements which have taken place the armour has invariably gained upon the guns. One result of the contest, however, is that the whole of the ironclads built during the period from 1860 to 1870 have passed out of the rank of first-class fighting ships, though they are still used for cruising purposes, and another is that the ships that compose the present navy display the greatest variety in their design and equipment. At the present period the ships of the first class are represented by some fifteen heavily-armed turret or barbette ships, armed with guns varying in weight from the 110-ton steel breechloaders of the *Benbow* and *Anson* down to the short and ineffective 35-ton guns of the *Decastation*. Of these vessels the largest is the *Inflexible*, having a displacement of 11,880 tons; and as she represents in her construction the fullest development of the turret system in the British navy, we take the following particulars from the account given of her by her designer, Mr. N. Barnaby, the chief constructor of the navy. He describes this ironclad as a floating castle, 110 feet long and 75 wide, rising 10 feet out of the water, and having above that again two round turrets planted diagonally at its opposite corners. Both castle and turrets are heavily plated with armour, and each turret has within it two guns of about 81 tons each. These guns are capable of firing all four together, at an enemy ahead or on either beam, and in pairs towards every point of the compass. Attached to this rectangular armoured castle, but completely submerged, every part being from 6 to 7 feet under water, there is a hull of the ordinary form, extending 18 feet below the citadel and 105 before and behind it, with a powerful ram bow, with twin screws and a submerged rudder. Within the rectangular walls of the citadel are inclosed the engines and boilers, the base of the turrets, the hydraulic loading gear, the magazines, and all those parts of the ship which are most vulnerable. On the top of the submerged hull, and before and abaft the citadel, is an unarmoured structure rising 20 feet out of the water, in which are the quarters for officers and men, but from which they would be withdrawn on going into action. The sides of the central citadel are fortified with two solid armour plates, each 12 inches thick, with strong teak backing between and behind them. The turrets, which are 12 feet high, with an internal diameter of 28 feet, are defended by 16 inches of steel-faced armour, are revolved by hydraulic machinery, and each turret with its guns weighs no less than 750 tons. The

sponging and loading of the guns is performed by apparatus at fixed points outside the turrets, but underneath the armoured deck of the ship, and they can be elevated so as to bombard a city or fortress at long range, or depressed so as to fire down on the deck of an enemy ranged alongside. The lower deck of the ship, defended by 8 inches of armour, is supposed to be quite shot or splinter proof, and it descends forward so as to strengthen the ram. Over this shot-proof deck, and at a level a little above the water-line, comes the middle deck, and the entire space between the two is divided into compartments arranged partly to carry coals and partly stores packed in water-tight tanks, forming further subdivisions of space. The compartments next the sides are filled in with cork, canvas, and oakum, designed to check the inrush of water. The whole vessel is divided into no fewer than 135 water-tight compartments, each of which has been tested by hydraulic pressure. The *Ajax* and *Agamemnon* are imitations of the *Inflexible* on a smaller scale, and the *Colossus* and *Edinburgh*, steel-built vessels of a later date, are essentially of the same type of structure.

A more recent design represents some important departures from this type. Of these vessels, known as the *Admiral* class, from their names, we may take the *Benbow*, launched in 1885, as an illustration. In this ship the displacement is 10,000 tons, and the principal dimensions are—length, 330 feet; breadth (extreme), 68 feet 6 inches; draught forward, 26 feet 3 inches; aft, 27 feet 3 inches. Instead of the high rectangular citadel of the ships of the *Inflexible* class, protection against shot and shell is provided for in the first place by a strip of steel-faced, compound armour, 18 inches thick, and about 150 feet in length, so placed as to cover the sides amidship to a depth of 5 feet below the load-line, and to a height of 2 feet 6 inches above the water. Over the part of the vessel so defended against horizontal fire there is also carried an armour deck, defended by 3 inches of plating, and at the sides and at the ends of the citadel this protective deck slopes down to meet the lower edge of the side armour, the mean depth of this deck below water being 8 feet. The boilers, engines, and magazines of the big guns are placed beneath this shell-proof deck, all the necessary openings being protected by sliding armour covers or armour gratings. The two barbettes each cover a space on the upper deck about 45 feet in width by 60 in length, and they are covered with sloping steel-faced armour, from 12 to 14 inches thick. An armoured shaft or "ammunition trunk," covered with iron plates 12 inches thick, provides for the lifting of the powder and shot from the magazines below to within each barbette. As in the *Inflexible*, a large number of water-tight divisions have been provided, certainly not fewer than 190, and the hull has not only a double bottom and double sides, but there is a water-tight platform over the hold throughout the entire length of the ship, which passes underneath the boilers, engines, and magazines. The armament consists of two 110-ton steel breechloading guns, one on each barbette, ten 6-inch breechloaders, five on each side, the end guns being so mounted that they can be fired fore and aft, eight 6-pounder quick firing guns, four Nordenfelts, and eight Gardner guns. The *Benbow* is also fitted with five torpedo ports, carries one second-class torpedo boat and three other small steamboats, and bears in addition a powerful ram in her bow. She has no masts, but her engines are designed to develop with forced draught nearly 10,000 horse-power, sufficient to give a speed of over 16 knots an hour. In the double bottom and sides, as well as in the other arrangements of the ships of this class, an attempt has been made to defend them against the attacks of moving torpedoes, but the recent developments of these deadly weapons have made it questionable whether the defence is sufficient. Great as may be the mischief wrought by the huge shells of modern

guns bursting within the sides of a ship, the danger arising from the explosion of a torpedo against the thin sides of the hull under water, especially in the region of the boilers or magazines, is greater. So strongly is this felt by some competent naval authorities that they have declared the day of the ironclad is past. The two largest vessels in the navy are the *Nile* and *Trafalgar*—the latter of which was launched in September, 1887. They show a return to the older system of construction—the belts being nearly the length of the ship, and turrets taking the place of barbettes in a central shield. The armour—partly steel and partly iron—is 18 and 20 inches in thickness. As regards size, these vessels are only surpassed by the great Italian ships, the *Italia* and the *Lepanto*, of 18,500 and 14,000 tons. The secretary of the admiralty, in defending their construction, stated that they would probably be the last of their kind.

In addition to the heavy vessels of the first-class the ships of the second class comprise a number of powerful vessels, some of which were built for other governments and purchased by the admiralty, and which are designed for cruising purposes and ocean warfare. Five of these are specially constructed to act as rams, and they all depend chiefly upon their steaming powers. The plating of these vessels varies from 8 to 12 inches, and their armament from guns of 43 tons, carried by the *Conqueror*, down to the 18-ton guns of the *Rupert*. The rigged ironclads, such as the *Neptune*, *Superb*, *Alexandra*, *Temeraire*, &c., represent a third class of very useful ships of war, though it is probable that no more of them will be built on any of the old types. The latest design of the cruising ironclad is represented by the *Impérieuse* and *Warspite*, carrying four 18-ton guns in barrette towers, with six smaller guns on the broadside, and defended with steel-faced armour from 8 to 10 inches thick.

Beyond the classes indicated there are over twenty ironclads of the earlier types, which are still retained in the service, but which, in the event of war, would be useful only for harbour defence.

An entirely new type of ship for aggressive naval warfare is represented by the *Polyphenus*, constructed at Chatham, which may be briefly described as a submerged steel tube pointed at each end, her convex deck covered with 3 inches of steel rising but 4 feet 6 inches above the water-line. She carries no masts, but her engines drive her through the water at the rate of 17 knots an hour. In revolving towers elevated above her steel deck she carries some machine guns, but she has no heavy gun at all, her powers of offence being concentrated in her powerful ram, 12 feet in length, and her two torpedo ports on each side amidships, from which she can eject Whitehead torpedoes. Her performances in the naval manoeuvres of 1885 excited much attention, and the opinion generally expressed among naval men was to the effect that she represents one of the most dangerous fighting ships afloat.

Next in importance to the heavy ships of the line come the swift cruisers which, in addition to their manifold uses as part of a fighting fleet, would be charged with the duty of protecting British commerce against the depredations of an enemy, and of driving his commerce from the seas. Recent years have marked a wonderful development of British commerce, and it is computed that when carrying power is taken as the basis of the calculation, Great Britain owns about half the mercantile tonnage of the globe. One result of this is that Great Britain is now open to attack in every part of the world, and on more than one occasion when war has appeared possible British commerce has been especially threatened by foreign politicians and journalists. For its defence the heavy ironclads are obviously out of the question, and though there are about 100 sea-going unarmoured vessels, building, in reserve, and in commission, unhappily the majority of them are too slow and too weakly

armed to be effective. The experience of the American civil war and the exploits of the *Alabama* and *Shenandoah* showed the terrible amount of destruction that a few swift cruisers might accomplish when directed only against the mercantile marine, and against such vessels a slow war steamer would be utterly useless. In the construction of the latest protected cruisers the elements of speed and coal-carrying capacity have been taken into account, but the vessels of this kind in commission and building are pitifully few when the requirements of the nation are fairly considered. In the event of war something might doubtless be done to utilize the more powerful merchant ships as armed cruisers, and the admiralty list of swift steamers, reasonably divided into compartments that would be available, is now considerably over 800. A converted merchantman, however, can never hope to be able to contend on anything like equal terms with a properly constructed fighting ship, and though such vessels would be very useful as auxiliaries, it is impossible to depend upon them to do the work of the regular ships of war. In his celebrated work on the British navy Sir Thomas Brassey has pointed out that the effective naval expenditure, compared with the value of the trade it is designed to protect, compares very unfavourably with that of most of the great European powers, and perhaps there is no department of the navy in which disparity is more prominent than that which exists between the extent of our mercantile marine and the vessels that would be available for its protection in the event of a sudden declaration of war. In reference to the building of ironclads, torpedo boats, rams, &c., differences of opinion exist among the highest authorities, but there is universal unanimity as to the necessity for a large number of swift, strong, protected cruisers, and yet, strange to say, no adequate preparation is either made or promised in this direction. Where fifty or sixty ships are required the authorities appear content to build some ten or a dozen, and this in spite of reiterated warnings from the most competent authorities in the country.

A similar indifference to the construction of torpedo boats existed until 1885, and Great Britain was left far behind in this respect by France, Germany, and Russia. In that year, owing to the threatened war with the latter power, the construction of a number of these boats was hastily ordered, but even with these the number appears strangely inadequate when compared with that of other countries. This branch of the subject, however, is more fully considered under the heading TORPEDO.

To no nation in the world is the possession of a strong naval force of so much importance as to Great Britain. France, Germany, and Russia are continental powers with vast military resources, and a sea-board that offers no particularly vulnerable points of attack. Their colonies are comparatively unimportant, and their united commerce does not equal in value that of England. The United States have a large extent of coast to defend, but they are situated nearly 8000 miles from Europe, and the Atlantic is an effectual barrier against European aggression. But the insular position of England, her proximity to the Continent, and especially to France her ancient and powerful rival, her numerous colonial possessions, her immense wealth, all point her out as a favourite object of jealousy, as particularly exposed to attack, and as therefore in vital need of a preponderant maritime force. When to this we add the facts that we are dependent upon our commerce, not only for the raw materials for our manufactures, but also for the larger portion of our food supply, so that a blockade of a few months would threaten us with starvation, the strength to cope with the combined fleets of two or three hostile nations may be regarded as absolutely necessary to our existence as a first-class power.

The navy is governed by a Board of Admiralty, at the head of which is a cabinet minister, who is called first lord,



\* with a salary of £4500 per annum; associated with him are six assistant commissioners, styled respectively senior naval lord, second naval lord, third naval lord (controller of the navy), junior naval lord, parliamentary civil lord, and civil lord. Under the board is a financial secretary, changing, like the seven lords, with the government in power; while the fixed administration, independent of the state of political parties, consists of one permanent secretary and a number of heads of departments, the accountant-general, director-general of the medical department, director of the engineering and architectural works, director of transports, director of naval construction, director of naval ordnance, and the directors of victualling and stores.

The navy of the United Kingdom is a perpetual establishment, and the statutes and orders by which it is governed and its discipline maintained—unlike the military laws, which the sovereign has absolute power to frame under the authority of an Act of Parliament—have been permanently established and defined with great precision by the legislature. With respect to the cost of the British Navy, the following were the estimates for 1887–88:—

Wages to seamen and marines, . . . . .	£2,540,700
Victuals and clothing for ditto, . . . . .	892,000
Admiralty office, . . . . .	211,300
Coastguard, naval coast volunteers, and reserve, . .	204,900
Scientific branch, . . . . .	108,800
Dockyards and naval yards at home and abroad, . .	1,732,000
Victualling yards at home and abroad, . . . . .	71,800
Medical establishments at home and abroad, . . . .	65,900
Marine divisions, . . . . .	21,700
Naval stores for the building, repair, and outfit of the fleet and coastguard, . . . . .	1,207,000
Of steam machinery and ships built by contract, . .	1,911,000
New works, buildings, machinery, and repairs, . .	553,300
Medicines and medical stores, . . . . .	56,100
Martial law and law charges, . . . . .	11,500
Miscellaneous services, . . . . .	195,100
<b>Total for the effective service, . . . . .</b>	<b>10,274,700</b>
Half-pay, reserved half-pay, and retired pay to officers of the navy and royal marines, . . . . .	801,400
Military pensions and allowances, . . . . .	906,500
Civil pensions and allowances, . . . . .	328,200
<b>Total for the naval service, . . . . .</b>	<b>12,311,700</b>
Army department—conveyance of troops, . . . . .	165,100
	<b>£12,476,800</b>

#### WAR-SHIPS OF EUROPEAN NATIONS BUILT OR BUILDING (COAST-DEFENCE SHIPS OMITTED).

The first class consists of ships of over 8500 tons displacement, and the second class of 8500 tons or under. Minimum thickness of armour in both classes, not less than 7 inches.\*

NATION.	Number of Ships.	Displacement.	TOTAL.		GRAND TOTAL.		
			No.	Displacement.	No.	Displacement.	
England	{ Built . . Building.	{ 1 cl. 13 2 cl. 14 1 cl. 9† 2 cl. 8	27  17	208-860  134-620	44	343-480	
		{ 1 cl. 3 2 cl. 12 1 cl. 7 2 cl. 10‡					
France	{ Built . . Building	{ 2 cl. 12 1 cl. 7 2 cl. 10‡ 1 cl. 2	15  17	116-912  121-520	82	238-432	
		{ 1 cl. 7 2 cl. 10‡ 1 cl. 2 2 cl. 2					
Italy	{ Built . . Building.	{ 2 cl. 2 1 cl. 5§ 2 cl. — 1 cl. 1	4  5	33-237  60-702		93-939	
		{ 2 cl. 2 1 cl. 5§ 2 cl. — 1 cl. 1					
Germany	{ Built . . Building	{ 2 cl. 8 2 cl. 1 1 cl. 1 2 cl. 3	9  1 4	68-047  5-200 21-218	10	73-247	
		{ 2 cl. 1 1 cl. 1 2 cl. 3 1 cl. 4					
Russia	{ Built . . Building.	{ 1 cl. 1 2 cl. 3 1 cl. 4   2 cl. 1	4	21-218  46-868	9	68-081	
		{ 2 cl. 3 1 cl. 4   2 cl. 1 2 cl. 6					
Austria	{ Built . . Building.	{ 2 cl. 6 2 cl. 1 1 cl. 1 2 cl. 8	7	31-040  6-900 19-419	7	87-940	
		{ 2 cl. 1 1 cl. 1 2 cl. 8 2 cl. 1					
Turkey	{ Built . . Building.	{ 1 cl. 1 2 cl. 8 2 cl. 1 2 cl. 1	5	19-419  6-700	5	26-119	
		{ 2 cl. 8 2 cl. 1 2 cl. 1 2 cl. 1					

\* This limitation excludes the older and more or less obsolete ironclads.

† Two ironclads of the 1st class and two of the 2nd have since been laid down: tonnage, 83,890.

‡ Including four armoured gunboats of 1610 tons displacement, each with 8 in. of armour.

§ Three additional ironclads of the 1st class since laid down: tonnage, 39,753.

|| Two ironclads of the 1st class and one of the 2nd class since laid down: aggregate tonnage, 25,822.

It is not easy to compare the naval strength of Great Britain with that of other nations; for, as will be evident from the preceding, the value of the ships of war at present in commission varies so greatly as to render any comparison of mere numbers misleading. The above list of battle ships of European nations is from Lord Brassey's *Naval Annual*.

The number of officers and seamen provided for the naval service in the estimates for 1887–88 was 62,500, including in this number 12,700 marines and 6170 boys for training. In addition to this number there are 4000 seamen employed in the coastguard service.

The naval force, like the army of the United Kingdom, is recruited by voluntary enlistment, but at the breaking out of a war, or in any other emergency, impressment may be resorted to. In the ordinary way the supply of seamen is readily maintained by the system of training boys for the navy, whose age for entry is from fifteen to sixteen and a half. None are taken from reformatories or prisons or who have been committed by a magistrate, but some are taken from the industrial school ships. If required able and ordinary seamen might be admitted direct into the navy, but volunteers of this kind are seldom taken



except from the reserve. In addition to the seamen and marines borne on the strength of the navy, there are four lines of reserve at the disposal of the admiralty—the coastguard, the seaman pensioner reserve, the royal naval reserve, and the royal naval artillery volunteers. Of these the coastguard is made up of men of good conduct who have served at least eight years in man's rating, and who must be either seamen, gunners, or trained men. The pensioner reserve is made up of men under forty-five years of age who are entitled to pension for length of service, the members up to the age of fifty being required to undergo fourteen days annual training. The royal naval reserve represents an important force which was instituted in 1859, and it comprises those officers and men of the mercantile marine and fishermen who are willing, in consideration of an annual retaining salary, to undergo each year a certain number of days' training on board a ship of war or at a naval reserve battery. The men are divided into three classes, the first consisting of A.B.'s, who have had at least eight years service in foreign going or regular coasting vessels; the second of ordinary seamen or fishermen between the ages of nineteen and thirty; and the third of boys who have been eighteen months under training in a mercantile training ship and one under an engagement to join a merchant ship for sea service. The reserve also includes since 1861 officers of the merchant service, certificated masters and mates being ranked in the reserves as lieutenants and sub-lieutenants. This force has averaged during recent years about 18,000 men.

**NA'WAB**, really the plural of the Arabian *naib*, a viceroy or deputy, but used as a singular by the Moguls to express their chief commanders and rulers, and so passing into the Hindu language with the same meaning. Its corruption into the English *nabob* is familiar, but it is still used as a title in India.

**NAX'OS**, one of the largest of the Cyclades, lies east of Paros, from which it is separated by a channel 6 miles wide. It is situated in the middle of the Archipelago, and is about half way between the coast of Greece and that of Asia Minor. The island is 19 miles long by 15 broad, and the surface generally is mountainous. It was formerly consecrated to Dionusos or Bacchus, in consequence of the excellence of its wine. This island was full of legends about Dionusos: for one thing, it had the reputation of containing the spot where Ariadne lay heart-broken on the cliff after Thêseus had basely deserted her, and so gave the "jolly god" his opportunity of consoling the forsaken fair one. In fact, the island was often called *Dionusias*. Another name for it was *Strongulé*, because of its round shape. The Naxians were an independent folk in early times, and though they fell under the power of Peisistratos, tyrant of Athens, they were soon free again. It was Naxos which, by resisting the Persians, fanned the Ionian revolt into flame in Asia, and thus indirectly brought about the Persian invasion of Greece. In the struggle Naxos itself was ruined (490 B.C.), and all its adult inhabitants were sold into slavery. After Salamis (480 B.C.) the island managed to shake itself free of the Persian yoke, but only to fall under the iron despotism of Athens utterly exhausted, thenceforth to disappear from history.

Naxos is the most fertile of the Cyclades, and its wine is still much esteemed; it produces corn, oil, cheese, cotton, silk, most kinds of fruit, and abounds with game. The chief town is called *Naxia*. The population is 18,000. The northern part of the island contains some mountains, from which came a kind of marble, which was much valued; it was called by the Greeks *ophiites*, on account of its being spotted like a serpent's skin. Emery is also found there, and forms an article of export.

**NAZAIRE, ST.**, a busy and rising seaport of France, in the department of Loire Inférieure, is situated at the mouth and on the north bank of the Loire, about 38 miles

west of Nantes, with which it is connected by railway. Its rise has been very rapid. Vessels unload for NANTES, and their cargoes are thence transported by rail; and the large transatlantic steamers leave this port for the Antilles, Mexico, and Cuba.

The place was little more than a fishing village when a few years ago the French government decided to construct a floating dock, to cover about 25 acres. This accommodation was further extended by the opening of a graving dock in 1871, by the enterprise of a Scotch firm, and by extensive works completed by the government in 1877. As the navigation to Nantes becomes more difficult, St. Nazaire receives more and more of the trade of its ancient competitor. The population in 1886 was 24,458. In 1861 the number was only 2391.

**NAZ'ARENE**, a name applied in the New Testament first to Jesus for his connection with Nazareth (Matt. xxvi. 72), and secondly to the Christians by the Jews (Acts xxiv. 6), the term in each case being one of reproach and scorn. It appears to have adhered to the Jewish Christians, and to have been accepted by them, for there are some fragmentary notices in the writings of the fathers of the existence of a sect bearing this name in the fourth century, the members of which dwelt chiefly in Cœlê-Syria, Decapolis, and Basanitia. They appear to have retained the observance of most of the rites of the Jewish law, but at the same time they recognized the new covenant as well as the old, and believed in Jesus Christ and the resurrection. They do not appear to have been regarded as heretics, but Jerome refers to them disrespectfully, and says, "Desiring to be both Jews and Christians, they are neither the one nor the other" (Epistle 79, to Augustine). They never attained any importance either by numbers or influence.

**NAZARETH**, a small town of Syria, in the pashalic of Acre, with 3000 inhabitants, two-thirds of whom are Greek, Latin, and Maronite Christians. This place has an enduring high association. It was the residence of "Jesus of Nazareth," before he entered upon his ministry, the abode of his parents Joseph and Mary. The site is a sweetly sequestered valley inclosed by barren hills, but clothed itself with rich grass, dotted with fig-trees, and small gardens lined with hedges of the prickly pear. A spring outside the town, arched over with stone, is traditionally regarded as having been visited by the Virgin to draw water, one of the legends which may be received without distrust, for daily at present women and girls with long white veils and bands of coins over their heads may be seen at the spot filling their graceful water-jars. Nazareth is on the northern side of the plain of Esdraelon, about 20 miles west of the Lake of Tiberias. Between the two the wooded and conical Mount Tabor rises boldly, from the summit of which the eye overlooks the lake and the greater part of Galilee, hails the snow-capped heights of Hermon, and catches sight of the country of Bashan and Gilead beyond Jordan, where primeval oak forests alternate with rich pastures and fertile corn-lands. Nazareth is not mentioned in the Old Testament: it was a city of the tribe of Zebulun, and afterwards of the north portion of Palestine, called Galilee, and was held in so little esteem by the Jews of Jerusalem as to give rise to the exclamation, "Can any good thing come out of Nazareth?" (John i. 46.)

**NAZARITE** or **NAZIRITE**, the name given in the Old Testament to a peculiar kind of devotee among the Hebrews. It is not the designation of any separate class, as the Nazarite vow might be taken by any person, and it only lasted for a specified time, thirty days being the usual period, according to the Mishna, though longer periods were not uncommon. The external marks of the Nazarite were unshorn locks and abstinence from wine and the produce of the vine in any form. The Nazarite was also forbidden to approach any dead body, even that of the nearest relation. The regulations of the Nazarite vow are given in

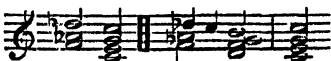
Num. vi., the precepts being evidently designed to bring an already well-established custom under the cognizance of the priesthood, and into harmony with the general system of religious observance.

**NE EXEAT REG'NO**, in law, is the name given to a high prerogative writ, issuing out of the Chancery division, to prevent a defendant debtor from going abroad and evading the jurisdiction. In earlier times this writ, which is founded on the real or supposed prerogative of the king to restrain his subjects from departing from the realm, was used only for great political purposes. Its modern use is based upon 32 & 33 Vict. c. 62, sec. 6.

**NEAGE, LOUGH**, a lake in the province of Ulster, in Ireland. Its form approaches to that of a parallelogram, having a length north to south of 18 miles, and a breadth east to west of about 11 or 12 miles. It is bounded N. and E. by Antrim, S.E. by Down, S. by Arinagh, and W. by Tyrone. The area is estimated at 154 square miles; and the circumference, following the windings of the shore, at about 80 miles. The surface of the lake is 48 feet above the level of the sea at low water, and its greatest depth is about 102 feet. It is the largest lake in the British Islands, and communicates by canals with Belfast, Newry, and Tyrone.

**NEAN'DER, JOHANN AUGUST WILHELM**, a distinguished German theologian and ecclesiastical historian, was born in Göttingen, 17th January, 1789. He was of Jewish parentage, his mother being a woman of tender and noble disposition. In 1806 he accepted Christianity, and adopted instead of his Jewish name, David Mendel, that at the head of this notice, by which he was ever afterwards known. In 1811 he betook himself to an academical career, settling at Heidelberg, where he was awarded an extraordinary professorship of theology. Here he published, in 1812, his monograph on the "Emperor Julian," a work which attracted much attention, and gained for its author, though he was then but twenty-three years old, the post of theological professor in the University of Berlin. Here he remained until his death (14th July, 1850), and during the whole of the thirty-eight years of his professorship he continued to exercise an influence as a public teacher such as has rarely been wielded in modern times. Students flocked to him from all quarters—France, Denmark, Great Britain, and the United States; and of all who were attracted to his lectures by his fame as a teacher, none went away without a deep veneration for the man. His most important work was his "General History of the Christian Religion and Church," the first volume of which appeared in 1826, and the fifth in 1845. A sixth volume was edited by Schneider and published posthumously in 1852. He also published, in addition to the monograph on the Emperor Julian, a series of similar works dealing with "St. Bernard and his Age" (Berlin, 1818), "On Gnosticism" (1818), "On Chrysostom" (Berlin, 1822), and "On Tertullian" (Antignostikus) in 1825. He was also the author of a large number of miscellaneous sketches from the history of the church and of theological opinion, while since his death his various courses of lectures have been published in a succession of volumes. Most of his works have been translated into English and published in Bohn's Standard Library.

**NEAPOL'TAN SIXTH**, a curious and beautiful chord, is the most usual form in which appears the chromatic concord given by the major triad on the minor second of the key. In the key of C this concord is the major triad on D ♯; and the Neapolitan Sixth is its first inversion. It is given below with the two most common resolutions. It occurs in both major and minor modes.



**NEAR'CHOS**, the son of Androtimos, was a Cretan by birth, but an inhabitant of Amphipolis on the Strumôn. He accompanied Alexander, whose personal friend he had been from youth, in his invasion of Asia, and was appointed by him to conduct to the Persian Gulf the fleet which had been built on the Hydaspes. The narrative of this voyage, the earliest of which any account is given, and which lasted from September to February 326-25 B.C., was written by Nearchos himself; and though the original journal has been lost, Arrian appears to have given us, in his "India," everything\* of importance which it contained. Nearchos was rewarded handsomely, and at the king's death became ruler of Lycia and Pamphylia.

**NEATH**, an ancient town and municipal borough of Wales, in the county of Glamorgan, situated on a river of the same name, a few miles above its mouth, 7 miles north-east of Swansea, and 208 miles from London by the Great Western Railway. The town is poorly built, except for some modern villas, a church with a lofty tower, the town-hall, and a market-house. The commerce has been steadily increasing for some years. Britton Ferry, which is about 2½ miles lower down the river, is connected with Neath by a canal running northward, 12 miles higher up the valley. By Britton Ferry, in fact, Neath acts as the vent of all the mineral districts connected with the vale. The corporation consists of four aldermen and twelve councillors, from whom the mayor is elected. The population in 1881 was 10,447. Neath stands on the site of the Roman *Nidus*. About a mile from the town, on the low ground bordering the river, are the ruins of Neath Abbey, founded by Richard de Granville in the twelfth century: the church is a mere heap of ruins; but the chapter-house, a curious specimen of early English architecture, is still in tolerable preservation; and foundations of buildings may be traced to a considerable distance.

**NEB'EL**, the great harp of the Jews, usually translated, most unfortunately, by "psaltery" in the Authorized Version, though the name psaltery is properly applied rather to instruments of the dulcimer kind struck with drum-sticks. Very absurdly this mistranslation has been continued in the Revised Version. Other mistranslations of *nebel*, as *viol*, and *psalm* (Psalm lxxxi. 2), and *lute* (Isaiah v. 12), have also been thus perpetuated. It would certainly have been wiser to have used either the proper name itself or to adopt one invariable translation.

**NEBRAS'KA** ("the shallow stream"), the name of one of the United States of North America. It formerly comprised a very extensive region, but is now limited to the country between lat. 40° and 48° N., and lon. 96° to 104° W. The Dakota territory, the state of Kansas, and the river Missouri are its principal boundaries. The area is 76,647 square miles, and the population in 1880 was 452,432. The *Mauvaises Terres*, partly in this state, is a sterile region, covered with abrupt fantastic masses of pyramidal rocks, resembling ruined cities. With the exception of this tract Nebraska is fertile and affords fine pasturage.

The state is drained by the river Nebraska (sometimes called *Platte*) and its tributaries. The river rises in the Rocky Mountains, and, after running in an easterly direction through the state, joins the Missouri near Platte city. Though its total length is 1200 miles, it is in general only about a mile wide; its depth is insufficient for navigation, and hence its name.

The buffalo, grizzly bear, beaver, otter, &c., are extensively hunted. Nebraska is now gaining rapidly. Its mineral products are extensive. About 75 miles south of Omaha there is a large salt basin, containing innumerable springs of the most concentrated saline waters. The climate is dry, pure, and healthful. Emigration overland to California, Oregon, &c., is made up by way of Omaha city and up the great valley of the Platte. From 5000 to 10,000 Mormons yearly pass through on their way

to Salt Lake. Anthracite coal and gold are found in the Black Hills.

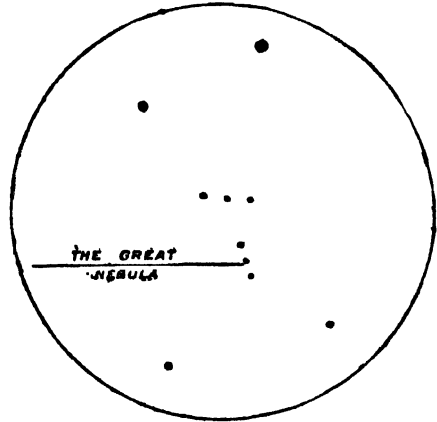
The territory of Nebraska was organized in 1854, and it was raised to the dignity of a state in 1867. The capital is Omaha, on the west bank of the Missouri.

**NEBUCHADNEZZAR**, or **NEBUCHADREZZAR**, the names given in the Old Testament to the best known, and one of the greatest of the Babylonian kings. In the cuneiform monuments the name appears as *Nabu-Kudurri-usur*, "Nebo is the protector against misfortune," or possibly "Nebo defend the crown." Nebuchadnezzar was the son of Nabopolassar, the founder of the Babylonian Empire. He appears to have been born about 644 B.C., so that he had almost reached the period of manhood at the time of his father's rebellion against Assyria, 625. In 605 he led an army against Pharaoh-Necho, king of Egypt, whom he defeated in a great battle, recovering Coëlé-Syria, Phœnicia, and Palestine. While engaged in this campaign his father died, and he made a hasty return to Babylon, where he ascended the throne (604 B.C.) Soon afterwards the influence of Egypt was directed toward stirring up a revolt in Syria and Phœnicia, and Nebuchadnezzar marched against Tyre and invested the city. Leaving a portion of his army to continue the siege he proceeded to Jerusalem, where he put the king, Jehoiakim, to death, but raised his son Jehoiachin to the throne. The latter was, however, only permitted to reign for three months, at the end of which he was carried off to Babylon, together with many of his subjects and the chief of the Temple treasures, by Nebuchadnezzar, who made the king's uncle, Zedekiah, ruler in his room. The latter rebelling, the Babylonian monarch took Jerusalem, after a siege of two years, and destroyed it. Shortly afterwards Tyre, which had bravely sustained a siege of thirteen years, fell also into his hands, an event followed by the complete submission of Phœnicia and a successful campaign against Egypt. Meanwhile Nebuchadnezzar had rebuilt the temple of Bel at Babylon, and had renovated the city throughout, adding one entirely new quarter, together with several lines of fortifications. He also finished the walls and built for himself a splendid palace, in the grounds of which were constructed the celebrated hanging garden. In addition to these immense undertakings he built or rebuilt numerous cities throughout his empire, repaired many of the temples, and constructed quays, reservoirs, canals, and aqueducts on a scale of grandeur and magnificence almost unsurpassed in history. Towards the close of his reign the brook of Daniel asserts he was attacked by lycanthropy and remained in this condition for some years, after which his reason returned and he resumed his throne and his public works. He died in the year 561 at an advanced age, after a reign of forty-three years, and was succeeded by his son, Evil Merodach. See also **BABYLON** and **BABYLONIA**.

**NEBULÆ.** This word is applied to denote certain telescopic objects which abound in the depths of space. One or two can be seen to some extent with the naked eye, but the vast majority require powerful telescopes for their detection; some of them indeed are only within the reach of the very greatest telescopes. The appearance of a nebula is usually unlike that of any other celestial body, except, in some instances, a telescopic comet. Nebulæ have occasionally been mistaken for comets, and not improbably comets have before now been recorded as nebulæ; but there is a very ready means of telling the difference—a comet is in motion, a nebula is at rest. In a few minutes or less a comet moves among the stars, but from one year to another a nebula remains at rest. In the accompanying Plate we present some of the varied forms which nebulæ assume. These figures have been copied from Lord Rosse's drawings (Plate 80, *Philosophical Transactions*, 1861). The numbers, H 2084, &c., denote the reference to Sir John Herschel's general catalogue, which contains references to

about 5000 of these wonderful objects. The figures here given show examples of some of the smaller nebulae, which are, however, bright enough to exhibit details on which the artist can seize. H 2084 is one of a very curious class of objects, called by Lord Rosse spiral nebulae; the remarkable convolutions are only within reach of the largest instruments. A special class of spiral nebulae is represented by H 2099, where the luminosity is very irregular. These objects are usually small, and devoid of the faint arms which stretch from the more ordinary spirals. H 2139 and H 2172 reach of the largest instruments. H 2139 and H 2172 are examples of elliptical nebulae, which are tolerably common. In these objects the light is generally somewhat brighter as the centre is approached. H 2241 is one of a small and very interesting class of objects known as planetary nebulae. They are so called because the nebula presents a rounded disc somewhat like that of a planet. Many of them are so small, and at the same time so bright, that they almost resemble stars; indeed, Professor Pickering has lately discovered that certain objects which in an ordinary telescope look like stars, are really found to be minute planetary nebulae when seen through the spectroscopic. Another small class of nebulae which are of extreme telescopic interest, are the annular nebulae, of which a celebrated object in Lyra is perhaps the best known (fig. 2). In other cases we have nebulae grouped together in a manner which suggests that they must have some physical bond of union (fig. 1).

The most splendid nebula in the heavens, and one of the most glorious telescopic objects in the whole sky, is the Great Nebula in Orion. It is fortunately within reach of instruments of moderate compass, and it is well situated for observation every winter. To enable the beginner to



find the Great Nebula, we give here a sketch of the leading stars in the splendid constellation of that name. At the centre are the three stars, well known as the Belt; while pointing up towards the central star of the Belt are the three stars which are part of the Sword. Around the central star, as indicated in the figure, lies the mighty nebula; it extends over a stupendous distance. The star itself, which forms the central feature of the nebula, is sufficiently remarkable; it consists of four stars quite close together, while a good telescope will show two more. From this point the nebula spreads away, and in powerful telescopes some branches can be traced over a degree or more, until they gradually dissolve in the background of the sky. Another brilliant nebula, visible indeed to the naked eye, is the great one in Andromeda (right ascension 0hrs. 35min.; declination 40° N.). This can be at once detected on a dark night as something quite different from a star. The telescope shows it to be a great elliptic nebula, with a second

one in the immediate neighbourhood. The nebula in Andromeda has specially arrested the attention of the astronomical world by the outbreak of a new star therein in the autumn of 1885. This new star is of the seventh magnitude, and is thus a brilliant object in the telescope. We can offer no explanation of this new star, unless it be that some vast collision has taken place. This event is specially interesting from the circumstance that it is the first definite change that has been observed in a nebula.

The nebulae are situated at enormously great distances from the solar system. The distance is indeed so great that the diameter of the earth's orbit, our only base-line for such measures, has been hitherto found inadequate, and we can only say that the distance of the nebulae is so great that we cannot ascertain it. Yet there are reasons for thinking that some nebulae are not more distant than some of the stars. It would be a coincidence altogether outside the grounds of reasonable expectation, that the most wondrously elaborate double star in the heavens should appear framed in the most splendid nebula, unless the star and the nebula were really a part of the same system. The multiple star in the sword-handle of Orion, and the Great Nebula surrounding it, must thus be regarded as evidence in support of the belief that at all events one of the nebulae is not more distant than some of the stars.

We here append a list (adapted from a longer list given by Newcomb) of the most remarkable nebulae which can be seen adequately by telescopes of moderate power. Perhaps, however, it may be well to add that a beginner's ideas of what a nebula is like before he has seen one, are often found a considerable exaggeration of the reality:—

LIST OF IMPORTANT NEBULÆ.

	Right Ascension.		Declination.	
	h.	m.		
Great Nebula of Andromeda,	0	36 ...	40° 37'	N.
Nebula, . . . . .	0	42 ...	25 57	S.
" . . . . .	3	29 ...	36 32	S.
Hind's Variable Nebula, . .	4	15 ...	19 14	N.
Great Nebula of Orion, . . .	5	29 ...	5 29	S.
Looped Nebula, . . . . .	5	39 ...	69 10	S.
Planetary Nebula, . . . . .	9	11 ...	36 7	S.
" . . . . .	9	18 ...	57 47	S.
Nebula, . . . . .	9	45 ...	69 38	N.
Planetary Nebula, . . . . .	10	2 ...	39 51	S.
" . . . . .	10	19 ...	18 2	S.
" . . . . .	11	8 ...	55 40	N.
Spiral Nebula, . . . . .	12	13 ...	15 5	N.
" . . . . .	12	17 ...	16 20	N.
Nebula, . . . . .	12	34 ...	10 57	S.
" . . . . .	12	36 ...	33 12	N.
Bifid Nebula, . . . . .	13	18 ...	42 23	S.
Spiral or Ring Nebula, . . .	13	25 ...	47 49	N.
Spiral Nebula, . . . . .	13	30 ...	29 16	S.
" . . . . .	13	32 ...	17 16	S.
Resolvable Nebula, . . . . .	16	10 ...	22 41	S.
Small Annular Nebula, . . .	17	14 ...	38 21	S.
" . . . . .	17	22 ...	23 39	S.
Trifid Nebula, . . . . .	17	55 ...	23 2	S.
Hooked Nebula, . . . . .	18	14 ...	16 13	S.
Annular Nebula of Lyra, . . .	18	49 ...	32 53	N.
Dumb-bell Nebula, . . . . .	19	54 ...	22 24	N.
Small Annular Nebula, . . .	20	11 ...	30 12	N.
Planetary Nebula, . . . . .	20	17 ...	19 44	N.
" . . . . .	20	58 ...	11 50	S.
Blue Planetary Nebula, . . .	23	20 ...	41 53	N.

As to the nature of the nebulae modern research has told us something. With each successive increase in telescopic power, it had been found that certain objects which appeared nebulous in lower powers were really clusters of myriads of minute stars. Some of these stellar clusters

are objects of the most intense beauty and interest. [See STAR.] The spectroscope has been applied by Mr. Huggins to the examination of this question, and he has obtained results which will be memorable in the history of astronomy. He has shown that certain nebulae are decidedly gaseous, and in this class he includes the planetary nebulae, the annular nebula in Lyra, and the Great Nebula in Orion. He has further shown that the gases present in these objects are identical in part with elements abounding on the earth; and in particular he has found that hydrogen and, to some extent, nitrogen are present in many of these objects (see Plate IV. LIGHT, fig. 49). It should, however, be added that other nebulae, of which the nebula in Andromeda is perhaps the type, do not show a gaseous spectrum, nor, on the other hand, have they ever been shown distinctly to be star clusters. As a general rule the gaseous nebulae are of a bluish hue, while those of the Andromeda type may be described as grayish.

**NEBULAR HYPOTHESIS.** This wonderful hypothesis, the grandest formulated in physical science since Newton's theory of gravitation, and indeed only inferior to that in its need of rigorous mathematical proof for many of its propositions, is due to the genius of LAPLACE, as recounted in the article upon the life of that philosopher. Although the nebular hypothesis offers several points for grave discussion, as has been indicated, yet so many facts tend to its substantiation (especially the discoveries of Mr. George Darwin as to the moon's motion in our own time), that it must be regarded for the present as true. That way the truth lies—is the least we can say, however cautious we may be.

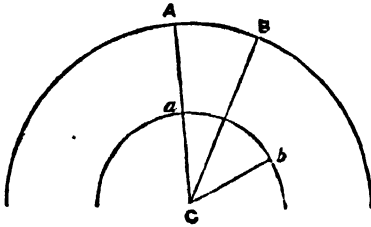
Divested of all mathematical complexity the main features of the hypothesis may be roughly summarized as follows. Laplace observed that a remarkable similarity reigned throughout the motions of the bodies composing the solar system with the exception of the satellites of Uranus and Neptune: the orbits of planets, and also of their satellites, are nearly circles and lie nearly in the same plane; and further, all planets and satellites alike rotate on their axes in the same direction as that in which they revolve round the sun. He calculated the odds of all these coincidences being the effect of chance against their being derived from some one cause operating on all alike; and the odds were several trillions to one in favour of some hidden cause. He therefore set to work to construct a hypothesis to cover all the facts, and with the inspiration of genius turned to the nebulae, or rather to the "nebulous stars" of Sir William Herschel, as possibly affording some clue to the birth of worlds. These bodies are in all stages of tenuity, from a mere gas to a highly advanced state of condensation, and their light varies from a feeble glow to the light of a star seen through a faint haze. Laplace hazarded the guess that these were successive stages of development, and the further he investigated the more reason he found for thinking he had hit upon the truth.

He supposes the whole of the space now occupied by the solar system to have been one vast nebula of the most extreme tenuity reaching beyond the orbit of Neptune; that is, more than 5,000,000,000 miles in diameter. The odds are infinite against so vast and so rare a medium being entirely homogeneous. Here and there the molecules would certainly lie a little thicker, and this being the case there must be also motion in the mass, for gravity would act and currents would set towards the denser parts. All these masses would tend to become somewhat separated one from the other, but at the same time the whole nebula would assuredly, under the influence of gravity, a force which always acts towards a centre, assume a generally spherical shape; and further, the heaviest masses would draw nearer the centre than the lighter portions. All the separated portions would, in exactly the same way, become spherical under the action of gravity. The length of time

needed for these changes may be as vast as we please to assume it. Most of the nebulae with which we are acquainted have shown no perceptible change for many centuries.

Under the continued action of gravity all parts of the nebula would be under pressure, the central parts being most pressed, and condensation would unite those central parts into one mass possessing somewhat of coherence. But when a great mass is thus composed of smaller masses each of which has motion within itself (as we at first postulated these distinct masses would have), then the combined mass can only remain at rest if all its parts so move as to balance each other. If there is a greater motion, for example, on the right side of the mass than on the left, the first motion will overcome the last, and in the case of motion in any other direction than exactly towards or from the centre of the mass, this supremacy of motion will not drag or push the mass through space, but twist it in a rotatory direction; that is, in the case named, the tendency of rotation will be from left to right. Under these conditions continually repeated the whole vast gaseous sphere will rotate on its axis, with a motion of rotation compounded of all the independent currents existing in the mass after it had assumed, under gravity, the spherical form.

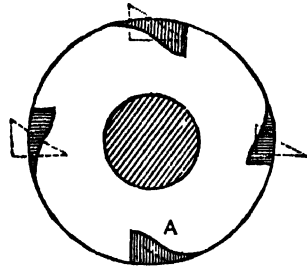
Now in this rotating mass every part is being whirled round at a given latitude, and is kept in its place in the sphere by the pressure of its neighbours; if free to move it would fly, under the pull of gravity, to the centre. The whole mass must therefore constantly contract. Now, if any particle is in motion and its orbit contracts under the



constant operation of a central force, we know from Newton's discoveries that its rapidity of motion will increase according to a fixed ratio. Thus let a point move in one month from A to B on a circle whose centre is C, and whose radius is CA, being pulled into the circular motion by a force at C. If it be gradually compelled to move in a lessened orbit so that it comes at last to move in the circle  $a b$ , whose radius is half that of A B, its radius must sweep out "equal areas in equal times"—that is, it must move to a point  $b$ , so far off as that the area A B C shall equal the area  $a b c$ , and this will necessitate a motion from  $a$  to  $b$  in the same time (one month) that it took under the former conditions to move from A to B. Therefore the greater the contraction the swifter the motion. But there is a limit, as every one who has swung a stone round at the end of a string knows very well. What is called the *centrifugal force* (absurdly, but almost universally) becomes stronger as the motion increases, and at last would, in the case of our rotating mass, come to balance the force of gravity when the rotation was swift enough, thus putting an end to contraction. Consider now what parts move fastest in a rotating sphere; manifestly these are the parts which lie on the surface of the sphere along the equator. These parts, then, will reach the balance of contraction and "centrifugal force" long before the other parts of the sphere, and will cease to contract. Soon they will stand out in a rim or band, and finally this rim or band will break off from the general mass. If it were to break off in an exactly regular band or series of bands we

should have the result shown in the rings of Saturn; if the band were full of centres of density of tolerably equal size it would condense into a number of small bodies, and we should get not one planet travelling in an orbit but many planets. This is the case with the asteroids. Finally, if the detached ring were very irregular, as would most generally be the case, we should find the matter in it gradually collecting round the point of greatest density, and we should get one planet representing the entire ring and revolving in its place, while the great mass of the condensed nebula shrank into closer condensation and resumed the spherical form. The process of condensation still going on in the great nebula, another ring would be formed considerably within the first, and so on; while at the same time the new planet, formed according to the hypothesis from the materials of the first equatorial ring, would itself condense and rotate on its own axis. From like causes this planet would, like the great parent mass, go on spinning faster and faster until it would in its turn throw off rings, and produce satellites which would behave towards it as it had done towards the great parent mass. Suppose the equatorial ring when torn off is irregular horizontally—that is, is heavier on the under side here, on the upper side there; then the resultant planet will of course revolve not equatorially with the original mass, but in a direction more or less inclined to it. Such is the case with nearly all the planets in relation to the sun, the earth among them. Our sun is the central residual mass of the original nebula, as is here asserted, the concentrated core of the whole system after all possible equatorial rings have been thrown off.

It may be objected that there is no reason shown why the planets should rotate on their axes, but this is necessitated by the following simple reason. If A be a part of a large rotating sphere it will rotate with the sphere as shown by the shaded figures at four positions. If now the sphere contracts and A is thrown off as above described, it will revolve as before, of course. But it will in so doing turn once on its own axis in every revolution. If not, it would occupy the position of the dotted lines and not of the shaded



mass. This rotation once established would quicken, as we have shown, as the mass solidified and contracted.

From the above resumé it follows that the first planets to be formed must have been of very little density, probably wholly gaseous, and also that they were likely to be large; further, this being granted, it would be apparent that there would be much greater probability of their forming satellites than of those planets later formed, when the parent nebula was taking greater consistency, and consequently the planetary rings when thrown off were denser. Such a result harmonizes very well with the solar system, where Mercury and Venus, the planets nearest to the sun, have no satellites; the Earth has but one; Mars, the next furthest off, has two; Jupiter, four; Saturn, eight; and Uranus and Neptune several, though we cannot exactly say how many, on account of the present difficulties of observing them.

The nebular hypothesis has also been turned to account to explain the erratic orbits of comets. If portions of the original nebula were left balanced between two contending masses, they would be pulled nearly straight down to the centre, when attraction ultimately overcame, and there would obviously be no reason why they should move in the plane of rotation of the spherical mass round which they revolve.

**NECESSARIES.** The question of what are necessities generally arises where a person, in answer to an action, pleads infancy; and is a relative fact, to be considered by the fortune and circumstances of the infant, and the proof of these circumstances lies in the person suing the infant. The word is not confined to such articles as are necessary for the support of life, but it extends to articles fit for the particular person, according to the state, station, and degree of life in which he moves. A watch and other things of a like kind may not be unnecessary to a young gentleman who goes into society where such things are worn; but a diamond ring, pictures, and race-horses cannot be necessities. Again, goods may be necessary in point of quality, but not in point of quantity; therefore when an infant is already provided with sufficient necessities by his father, and consequently is under no necessity to purchase more, he is not liable.

**NECESSARY TRUTHS.** See *IDEA*, section *Innate Ideas*.

**NECESSITY**, according to the common definition, is that by virtue of which a thing cannot but be, or whereby it cannot be otherwise. When, in a proposition which affirms anything to be true, there is a fixed invariable connection between the subject and the predicate, then that thing is understood to be necessary. Necessity is opposed to chance, accident, contingency, and to whatever involves the idea of uncertainty and of possible variation. It is usually distinguished into logical, physical, and moral necessity. Logical necessity consists in the circumstance that the conception of something being different from what it is implies a contradiction or absurdity. In this sense it is necessary that two and two should be four, that converging lines, if produced far enough, should meet. Physical necessity has its origin in the established order and laws of the material universe. The necessity in this case is a necessity of consequence. Everything that takes place in the natural world happens by virtue of certain laws, known by experience to operate uniformly; and the results of their operation are hence, with reference to them, said to be necessary. When we ascribe anything to chance we merely state our ignorance of the law or laws to which its existence is to be referred. Physical necessity is founded on the relation of cause and effect. By tracing back this connection we arrive at the knowledge of a great first cause—that is, God—who is the only being existing independently and by an absolute necessity. Moral necessity has reference to the volitions and actions of rational agents, and is intended to express the connection between these volitions and actions and certain moral causes, as inclinations, desires, or motives generally. It seems reasonable to state this as another case of the necessity of consequence. In the conflict of motives the stronger motive must win. But this simple and philosophical explanation shocks the minds of some, who fancy that it deprives them of an imaginary freedom from law which their will possesses. Thus arose, and even yet exists, the controversy over freewill or liberty and necessity, dealt with in the present work under *FREEDOM OF THE WILL*.

↳ **NECK.** See *ATLAS*, *AXIS*, *BACKBONE*.

**NECKAR**, a river of Germany, rising on the east side of the Schwartzwald, on the borders of Würtemberg and Baden, and flowing N. E. N. and W. to join the Rhine at Mannheim. It has a course of about 220 miles and is shallow, but steamers navigate it as far as Heilbronn.

**NECKER, JACQUES**, a celebrated French minister, born at Geneva on 80th September, 1732, was sent to Paris in his youth, and employed in the house of Thellusson, the banker, who took him into partnership. In the course of twelve or thirteen years he realized a large fortune and retired from business. He now began to aspire to official situations, and wrote several works on financial affairs, which made him favourably known. His memoir upon the French finances so delighted the minister Maurepas that he obtained for the author the appointment of director of the Treasury in 1776. Necker was appointed director-general of the finances in June, 1777, when, being averse to imposing new taxes, he endeavoured to make up the deficiency in the income by economy and loans. In 1781 he published his "Compte Rendu," which disclosed for the first time the state of the revenue and expenditure of France. Being refused a seat at the council on the score of his being a Protestant, he tendered his resignation in May, 1781. He withdrew to Switzerland, where he purchased an estate at Coppet, on the banks of Lake Lemman, and here he wrote his work "Sur l'Administration des Finances" (1784).

In 1787 Necker returned to Paris, where he wrote against Calonne, who had just been dismissed from his office of comptroller-general of the finances. In the following year (August, 1778), on the resignation of Brienne, Louis XVI. appointed Necker director-general of finances, as the only man capable of restoring order in the administration. His second ministry was short. Unable to check or direct the popular storm which arose on the assembling of the States-general, Necker left Paris and retired to Switzerland; but after the taking of the Bastille the National Assembly demanded the recall of Necker, and Louis complied. Necker was received in triumph, but he was no statesman, and failing to understand the importance of the crisis, his popularity was short-lived. In December, 1790, he gave in his resignation to the National Assembly, and though a few months before he had been received with acclamation he now had to make his way to Switzerland as a fugitive. He spent the remainder of his life in Switzerland, and wrote several political tracts. He had written, several years before, a work "De l'Importance des Opinions Religieuses." He died in April, 1804. His daughter was the celebrated Madame de Staël.

**NECKLACE, THE DIAMOND.** See *DIAMOND NECKLACE*.

**NECK-VERSE**, the first verse of Psalm li., "Have mercy upon me, O God," &c., so called because, under the ancient *BENEFIT OF CLERGY*, when a condemned criminal who could read claimed exemption (as a "clerk") from civil jurisdiction this verse was always given as a test; and he who could read it saved his neck, being burnt in the hand and set at liberty.

**NECROMANCY** (Gr. *nekros*, dead, and *manteia*, prophecy), a sort of divination by consulting the spirits of the dead, somewhat similar to our modern spirit-rapping, and much practised by the ancients. The witch of Endor is a remarkable instance of the prevalence of the custom among the Jews. The Greeks performed the ceremony of invoking the dead in various ways; and if they appeared in an unsubstantial form they were called *psychomanteia* or *skiomanteia*. No souls could, as they supposed, be so readily called up as those whose lives had been terminated by an untimely death or by acts of suicide, because they were supposed to be detained at the confines of the nether world.

**NECROPHORUS.** See *BURYING BRETTLE*.

**NECROPOLIS** means literally city of the dead, and is the name applied to the cemeteries in the vicinity of ancient cities of the East. The name occurs in the writings of Strabo and Plutarch, and large necropolises have been found near Alexandria, Thebes, Cyrene, and in Lycia, Sicily, and many other places. They often consisted of tombs built like houses and temples, and arranged in streets—a real

city of the dead; and sometimes of caverns hewn in a rock and ornamented with façades, in imitation of real buildings. The same name has also been given to some modern cemeteries, as at Glasgow, Liverpool, &c.

**NECRO'SIS** is the term applied particularly to mortification or death of bone. Its general causes and the mode of reparation are the same as those of mortification generally.

**NECTAN'DRA**, a genus of plants belonging to the order LAURINEÆ. *Nectandra cymbarum* is a tree nearly 100 feet high, growing in the woods of the Orinoco, where it is called Sassafras, and also in the ancient forests of the Rio Negro in Brazil. The bark is aromatic, bitter, and stomachic. Martius suspects that it is one of the ingredients in the famous ourari poison of Guiana. The bark of *Nectandra cinnamomoides* has the smell and flavour of cinnamon, as which it was used in New Granada. *Nectandra Puchury major* is said by Martius to bear the picurim bean. In the early months of the year the fruits drop from their cups to the ground, and are collected by the natives, and then cleaned and dried by a gentle heat. They are prescribed in dysentery, diarrhoea, cardialgia, strangury, &c. *Nectandra Rodiei* affords valuable timber, commonly known as GREENHEART.

**NECTAR**, the drink of the gods in the classical mythology, *ambrosia* being their food. Nectar resembled red wine in appearance, but had a fragrance beyond all expression, and it was its continued use which conferred immortality upon the gods. For these particulars we have the unimpeachable authority of the ancient poets.

**NECTARINE** is a smooth-skinned variety of the PEACH.

**NECTARIN'IDÆ**. See SUN-BIRDS.

**NECTARY**, in botany, a term first used by Linnæus to designate those appendages of the corolla which secrete honey. The term has, however, since the time of Linnæus, been used in a general sense to express any organ existing in the flower between the corolla and pistil, and which could not be rightly assigned to these or the stamens. Such parts or appendages of the flowers have at a later period had other names assigned to them, such as *corona*, for the cup-shaped appendage in the daffodil. At the present time the term is applied to such parts of the floral leaves, or even of the receptacle, as secrete the sugary juice called *nectar*. Nectaries are found on the calyx, e.g. on the exterior in Hibiscus, on the interior in trefoil and lime, or in the spur of the calyx in the garden Nasturtium (*Tropæolum*). On the corolla they occur in such places as the base of the petal in buttercup, at the bottom of the small tubular petal in hellebore, or at the end of the spur of monkshood. They are found on the stamens in the violet and marvel-of-Peru; and also on the carpels at base (some Solanaceæ) or summit of ovary (Umbellifere). When the nectary is part of the receptacle this is called the disc, and appears as a ring or circle of protuberances between some of the floral whorls. The honey attracts insects, and the position of the nectary in its relation with other parts has often the effect of preserving the honey for such insects only as can cross-fertilize the flower.

**NED'JID**. See ARABIA.

**NEED-FIRE**, fire obtained by the friction of two sticks (Swedish *gnida*, to rub), properly *knead-fire*. The use of this fire for superstitious purposes is very widespread. In the Highlands it was practically universal up till well within the present century, and is still continued in remote parts. All the fires in the village are extinguished, and the sacred element supplied to them afresh in the form of need-fire. Thus the angry spirit is pacified, whether it be a plague, or a disease among the cattle, or a blight on the crops that he has sent to injure the folk. Probably the ceremony is a symbolical acknowledgment that fire is the gift of the gods, and an expiation for the crime of Prometheus, who stole it in the first instance.

**NEEDHAM, MARCHMONT**, one of the first authors of our newspaper press, was born at Burford, Oxon, 1620, and educated at Oxford, where he graduated in 1687. At the outbreak of the Civil War Marchmont Needham girded at Charles in the *Mercurius Britannicus* (1643, &c.), for which he was caught, imprisoned, and only set at liberty upon professions of repentance and amendment. These he carried out in the *Mercurius Pragmaticus*, as fierce a diatribe in newspaper form against the Parliament-men as the *Britannicus* had been against the king. But the Roundheads, catching Needham, imprisoned him in their turn, whereupon he recanted his recantation (for man must live), and upon being set free started more bitterly against King Charles than at first, with the *Mercurius Politicus* (1649-1660). It was then wise to cease, for Charles II. came to reign; and Needham's pen was known no more, in open warfare at all events, its owner by timely submission having obtained the young king's pardon. Needham died in 1678. It certainly is cheering to see the great advance from these times to the present integrity of newspaper-writers and proprietors.

**NEEDLE**. This instrument, used for sewing together textile fabrics, skins, furs, &c., has been in use from prehistoric times wherever men have worn garments made of skins or woven cloths. The primitive needles were probably rude eyeless bodkins, fish bone, animal bone, or ivory being used in their manufacture, and at the present day the Eskimos and some other uncivilized peoples use rude bone needles to sew together the skins of the animals taken in the chase. Since the time of the discovery of bronze, metal needles have been used by all civilized nations for fine work, but needles of wood or bone are still employed in some descriptions of fancy work. It is said that steel was first used in the making of needles in Germany towards the end of the fourteenth century, and the manufacture of steel needles was introduced into England by a colony of Germans who settled at Redditch, in Warwickshire, a town which still maintains its place as the chief seat of this industry in Great Britain.

In the making of the common sewing needles, soft steel wire of the required thickness is cut into lengths each sufficient for two needles; and these lengths, collected into bundles of several thousands each, are bound together by means of iron rings, and after being heated to redness are rolled to and fro upon a cast-iron table under the pressure of a flat bar of iron, until the wires are rendered perfectly straight. They are then passed on to the grinder, who sits over a dry grindstone, and holding several dozen wires at a time in his hand contrives by a dexterous rolling motion to bring both ends of the wires to a point. This operation is attended by the creation of much fine steel-dust, and needle-grinding was formerly one of the most deadly of the industrial occupations of Great Britain. At the present day the operative is partially protected by means of a cowl which partly covers the grindstone, and serves to direct a current of air against it, thus sucking away a great portion of the dust evolved; but this protection is inadequate and imperfect, and attempts are constantly being made to substitute machinery for manual labour in this operation. Pointing machines are extensively used in Germany, and it is said they are more economical than hand labour, although a skillful workman can point by hand about 100,000 needles in a day. After the lengths of wire have been sharpened at both ends the oxidized scale at the centre is scraped off, and each wire is separately stamped by means of dies with the grooved and rounded impressions of two needle heads set end to end. The piercing of the eyes is done by means of a hand screw-press, in the descending arm of which there are two steel points or cutters of the exact size of the eye to be made. Each wire now forms two needles, attached head to head, and through the pierced eye a fine wire is run and a hundred or so are strung together. Each



\* side is then clamped up tightly, the burr or bulge at the centre is removed by filing, and the wires, which have been weakened at the centre in the stamping process, are broken across, thus leaving two rows of rough needles strung on wire. These rows are gripped firmly in a hand-vice, and the heads are rounded and smoothed by filing, after which the wire is withdrawn and the needles are set free. The next process is *oil tempering*, and the needles, placed in an iron tray, are heated to redness in a muffle furnace, then plunged in an oil bath, reheated until they assume a straw colour and gradually cooled. They are now ready for scouring and polishing, and are ranged in parallel rows upon a coarse cloth, which has been smeared with a mixture of oil, soft soap, and fine emery powder. In this cloth from 40,000 to 50,000 needles are rolled up, and several of these rolls are placed together in a machine similar to a mangle. The rolling to which they are here subjected is continued, by means of steam or water power, for two and sometimes three days, during which the cloth covers being worn out, require to be once or twice replaced by new ones, putty powder being substituted for emery during the latter stages of the process. On its completion the needles are washed in an alkaline solution and dried in bran or sawdust. They are then arranged so that all the heads lie in one direction, the broken and defective specimens being picked out, the eyes are blued and softened in a gas flame, and are then drilled into smooth, round, or oval holes, by means of a roughened wire over which is spread a fine paste of oil or emery. The needles strung on this wire are oscillated backwards and forwards until the eyes are polished sufficiently to prevent any friction on the thread in sewing with them. A final polishing on emery wheels leaves the needles ready for sorting, papering, and packing.

Many different patterns of needles are required for packing and upholstery work, for sewing machines, and for the use of surgeons. In the needles used for sewing machines the eye is drilled as near the point as possible, and many of them are curved in shape, curved needles being also required in surgery. English needles have the reputation of being the best in the world, and their manufacture, which is located in Worcestershire and Warwickshire, gives employment to a large number of persons.

**NEEDLES, THE**, a cluster of three pyramidal and pointed rocks of chalk in the English Channel, opposite the coast of Dorsetshire, and off the west point of the Isle of Wight, one of which is surmounted by a lighthouse, in lat.  $50^{\circ} 39' 9''$  N., lon.  $1^{\circ} 34'$  W. The passage between the Needles and the mainland is about three-quarters of a mile in width.

**NEEM-TREE**. See MELIA.

**NEGATIVE**. The negative in English is curiously irregular and defective. The original negative *ne* has quite disappeared. Its effect is seen in *no*, which is a shortened form of *none* (i.e. *ne an*, not one), and in *not*, *naught*, both of them varieties of *ne aught*, neither = *ne either*, and *never* = *ne ever*. *No* and *none*, though thus seen to be in origin singular, are used with plural substantives; thus, the elder "none monckes" is the modern "no monks." The identity of *no* and *none* explains many phrases in our older speech, such as "Thou shalt have none other gods before me." To the Elizabethan writers "no other" would have sounded as uncouth as "a other" for "another."

In later English, as in Latin, double negatives destroy each other. "I am not ignorant," means "I know;" "not unhealthy" means "healthy," but to a less degree of certainty than the affirmative assertion.

Many fine negative forms have unhappily dropped out of English. *Yes* (Old English *gese*) once had its negative *nes* (Old English *neese*); and many verbs had their negative forms. We still use one phrase, "willy-nilly," embodying the old form *nill-ye* (i.e. "will ye not"), which ran through the verb; but we have quite lost *nam* (*I nam*, =

am not, *I ne am*), *naht*, *nis*, &c.; and *we were* would no longer be held to mean "we were not," as it once did.

Double negatives, characteristic of Greek, were equally forcible in our earliest English. Thus Chaucer—

"He never yet no villanle ne sayde  
In all his life unto ne manere wight."

The poets, indeed, continued to use double negatives for some time. Shakespeare has many passages such as this;—

'This England never did, nor never shall  
Lie at the proud foot of a conqueror."

**NEGATIVE**. See PHOTOGRAPHY.

**NEGATIVE QUANTITIES**, that is, quantities less than nothing, are the great invention of algebra, and constitute perhaps its chief superiority to the ordinary arithmetic. If from zero there is a series extending to the right, increasing in value as the figures rise higher, as 0, 1, 2, 3, &c., the inventors of algebra argued there might be conceived a set of quantities exactly reverse to these, and extending to the left, decreasing in value as the figures rose higher. Thus:—

—3, —2, —1, 0, 1, 2, 3.

The symbol — (minus) was taken to mean not merely the operation of subtraction, but the opposite of the symbol + (plus) in every way. If a man is bankrupt and owes £50, we may say he possesses —£50 (minus fifty pounds), that is, he has £50 worse than nothing; it would take, in fact, £50 to make him a penniless man. So also if from a certain point we agree to measure angles round a circle to the right,  $4^{\circ}$  would mean four degrees so measured, and  $-4^{\circ}$  would mean four degrees measured in the contrary direction. So also a wall might be said to stand —5 inches, which would certainly mean that it was 5 inches below the ground.

The convenience of dealing with negative quantities cannot be over-estimated, but care must always be taken to recur to their true meaning. For instance, 4 is greater than 3, but —4 is considerably less than 3. It is evident, then, that if we add quantities together in algebra, the sum need not be, as in arithmetic, larger than any one of the quantities added; for some of these quantities may be positive and some negative, or all may be negative. If we add —3 to —5 we get —8, if we add —3 to +5 we get +2. (The sign + is, however, not usually expressed, all quantities not specially prefixed with the negative sign being assumed to be positive.) The rule of algebraical addition is therefore to add like quantities with like signs, and when quantities have unlike signs to subtract the less figure from the greater, and place the original sign of the greater before the result. Thus,  $-3a + 5a = 2a$ , but  $3a - 5a = -2a$ .

The operation of algebraical subtraction where negative quantities are concerned is at first sight not so easy to understand, but it becomes clear when we think that the meaning of subtraction is to find out what sum added to the subtrahend will produce the minuend. Thus, in subtracting 4 from 9, what we do is to discover that 5 added to 4 makes 9. Hence arises the algebraical rule—"Change the sign of the subtrahend, and add the changed quantity to the minuend." For if to the remainder, thus obtained, we add the subtrahend with *unchanged* sign, it is evident that this will entirely neutralize the operation just performed with *changed* sign, and will therefore give the minuend. To subtract 4 from 9 algebraically, we add —4 to 9, and our algebraical "sum" is 5. If there are several terms in the subtrahend, the sign of all of them must be changed. To subtract  $5a + b - 3c$  from  $7a - 4b$ , we should proceed thus:—

$$\begin{array}{r} 7a - 4b \\ -5a - b + 3c \\ \hline 2a - 5b + 3c \end{array}$$



The rule for multiplication and division, when negative quantities are involved, is to perform the operation in the usual way, regardless of the sign, and then prefix + when both quantities are alike in sign (either both + or both -), and - when they are unlike.

In the statement of an algebraical equation, such as  $x + a = b - y$ , any of the quantities may be changed to the other side of the equation if its sign be changed. For both sides of the above equality let  $y - x - a$  be added, which it is evident leaves the equality of the two expressions unaltered, since the same quantity is added to each. Then the whole equation stands thus:—

$$x + a + y - x - a = b - y + y - x - a$$

Reducing the equation by adding similar quantities, we have

$$y = b - a - a,$$

where all the quantities but  $b$  have changed sides, but their signs have at the same time been altered.

These are some of the simplest and most frequent advantages of the use of negative quantities. More recondite uses are explained in such articles as INDICES, THEORY OF, section *Negative Indices*, &c.

**NEGLECT**, in law, has been defined as the omitting to do something that a reasonable man would do, or the doing something that a reasonable man would not do; and an action may be brought if thereby mischief is caused to a third party not intentionally. A very important distinction exists between injuries arising from a wilful act, and injuries the result of negligence and carelessness, in regard to the liability of the parties. Where an injury is the immediate effect of any wilful act of a party, the action can only be maintained against the party committing it; but where an accident occurs through want of skill or carelessness or negligence, the party injured may recover not only against the party who caused the injury, but in general against his master or employer. By the Employers' Liability Act, which came into operation 1st January, 1881, employers guilty of negligence are made liable for injuries caused to their workpeople, and they are also made responsible for the negligence of any superintendent they may employ, or for that of any person empowered by them to give orders or directions.

It is the general view that there are three degrees of negligence—(1) *ordinary*, which is the want of ordinary diligence; (2) *slight*; and (3) *gross*, answering to the *levis*, *levissima*, and *crassa* of the Roman law. This distinction is important in contracts of bailment, for if a thing be deposited with a bailee for the bailor's sole benefit, the bailee is liable only for gross negligence; where the bailment is for the benefit of bailor and bailee alike, each is liable for ordinary negligence; and where the thing deposited is for the bailee's own benefit he is bound to use great diligence, and even slight negligence will render him liable. *Contributory* negligence is where a person has by his own want of care contributed to bring about a loss or accident, and cannot therefore recover damages against the defendant. See also BAILMENT.

**NEGRO** (Spanish and Italian *negro*, from the Latin *niger*, black), in anthropology, is the name given to one of the great races into which the human family is divided, which is distinguished from the rest by certain marked physical and mental characteristics. In the fivefold division of Blumenbach the negroes occupy the first place under the variety *Ethiopian*, while in Latham's threefold division they are placed among the *Atlantida*.

In the widest sense of the term it embraces all the dark-skinned races, whose original homes are the intertropical and subtropical regions of the eastern hemisphere, but more generally it is employed to designate only a portion of the population of Africa and the Melanesian or Papuan races. In Africa the true negro districts are confined to that portion of the continent south of the Sahara, and

north of the domains of the Zulu-Kafirs, who must be regarded as of Negroid or sub-Negroid descent, rather than of strictly negro.

The negro of the pure type is distinguished by a variety of physical characteristics, of which the following are the more marked and prominent:—(1) A skin of a deep brown or black colour, unctuous and velvety to the touch, which is generally liable to a profuse perspiration, and which emits a peculiar rancid odour somewhat resembling that of the male goat; (2) an extremely thick and solid skull, long and narrow in shape, the cheek-bones being high and prominent, and the jaws projecting forward so as to give a facial angle of about seventy as compared with the Caucasian eighty-two; the head covered with short black hair, woolly in appearance and capable of being felted like true wool; (3) a full black eye with black iris and yellowish sclerotic coat; (4) a short flat nose deeply depressed at the frontal suture, broad at the extremity, having a concave ridge and dilated nostrils; (5) thick protruding lips which show plainly the inner red surface; (6) arms on an average 2 inches longer than those of the Caucasian, but which sometimes reach in an erect position as far as the knee-pan; (7) comparatively weak lower limbs, the bones of the tibia and fibula being more convex in front than in Europeans, and the calves of the legs being high, so as to encroach upon the hams, while the foot is broad, flat, and has a markedly projecting heel. The average cranial capacity of the negro is considerably less than that of the average European, the weight of the negro brain being about 35 ounces, 15 ounces above that of the highest gorilla, but about 10 ounces below that of the average European. The cranial sutures close much earlier in the negro than in other races, and many observers are disposed to find in this fact the reason for the marked mental inferiority of the race as compared with others. Missionaries and teachers are almost unanimous in their testimony that negro children are bright and intelligent, and that they often acquire knowledge with greater rapidity than European children; but when they arrive at puberty a change comes over them, and further development seems to be arrested, or at any rate is checked very considerably.

The negro races of Africa which are found in the river valleys of the Senegal, the Niger, and the Gambia, and in the vicinity of Sennar, Kordofan, and Darfur, bear a strong general resemblance to each other, not only in their physical appearance, but in their intellectual capacities, moral instincts, customs, and manners. They are not unacquainted with agriculture, and they display considerable skill in some of the simpler industrial arts. They work iron and copper, make numerous useful household utensils, manufacture arms, ornaments, and pottery, and are acquainted with coarse weaving. They also display in some instances considerable ingenuity in the construction of their dwellings, but these are always of a temporary character, and architecture may be said to have no existence among them, except where they have come under foreign influences. Their literature is purely oral, and is limited to a few tribal legends, some folk-lore, proverbs, and songs of the simplest kind. Where they have not been brought under the influence of Christianity or Mohammedanism their religion is chiefly a debased, fetich worship, and is primarily one of fear. They believe in good and evil spirits, and they endeavour to propitiate the latter by sacrifices, and some of their rites are of the most cruel and sanguinary character. [See DAWOMEE.] The practice of cannibalism is also very common among the negro races, and there are tribes who make war upon their neighbours solely to obtain a supply of human flesh, the bodies of the slain uneaten being dried for future consumption, and the prisoners being kept like cattle to be killed as they are wanted for food. In certain districts human flesh is regularly offered for sale in the open market-place. Even in Hayti

cannibalism is secretly practised among the negroes, and human beings, spoken of as "goats without horns," are frequently offered as sacrifices, and are then devoured by the worshippers. The great bulk of the negroes are organized merely into tribes, under chiefs who rule despotically, and are generally tyrannical and cruel in the extreme. They are also very much under the dominion of sorcerers and witch-doctors, a belief in witchcraft being almost universal and the cause of the most inhuman cruelty. Polygamy generally prevails among the negro tribes, and the wealth and power of a chieftain often is estimated according to the number of his wives. The negroes also from the earliest times have been the victims of slavery, and they have always been found ready to sell one another. Whenever a tribe has gained an ascendancy in a district its weaker neighbours have had to submit to slave-raiding expeditions, and for thousands of years a constant stream of slaves has been brought from the interior to the east coast, and thence directed to Arabia, Persia, Egypt, Asia Minor, and the Barbary States. Since the discovery of America hundreds of thousands have in the same way been shipped from the West Coast for the West Indies, the Spanish possessions in South America, Brazil, and the United States. It is impossible to estimate the amount of human suffering caused by this abominable traffic in past generations; and even at the present day, when it is discouraged by civilized nations, it still causes widespread desolation in many of the regions of Africa, and retards most seriously all progress towards civilization. Happily every year renders the slave-trade more difficult, and there is good reason to hope, now that Africa is being so rapidly opened up by traders and explorers, that its extinction is within measurable distance. In Brazil, which is the only country in America where slavery legally exists, a law has been passed designed to bring about the gradual emancipation of the negro slaves, who are supposed to number rather over 1,500,000. In the Spanish colony of Cuba slavery is still permitted, but an arrangement with the planters has been made by the home government, whereby the whole of the 130,000 slaves of that island are to be freed by 1890.

In the United States the negroes form an important element in the population, the number returned at the last census of 1880 being 6,580,793. Slavery was abolished throughout the whole of the United States by the Thirteenth Amendment of the Constitution, passed 18th December, 1865, and subsequent amendments passed in 1868 and 1870 gave the freed slaves all the rights and privileges of citizenship. Since then earnest efforts have been made by philanthropists to civilize, Christianize, and educate them; but though the prospect for the future has much that is hopeful, the present condition of the negroes of the Southern states is very low, both socially and morally. It has been observed that the negro is "non-moral rather than immoral," and though he yields readily to religious impressions they chiefly affect his emotional nature. It would be hard to find anywhere a greater fervour of devotion than that which prevails among the negroes of the Southern States of America, but at the same time they are often strongly addicted to theft, falsehood, and sexual immorality. On the other hand, it must be remembered that these communities have hardly yet had time to outgrow the evil traditions of slavery, and in the history of missionary effort among the negro races there are to be found abundant instances of lofty self-denial and earnest devotion to duty on the part of negroes who have embraced Christianity.

With respect to intellectual capacity, the inferiority of the negro race to the white is beyond question. All through the historic period the different negro tribes have remained without making any perceptible advance in civilization, except where they have come under foreign in-

fluence, and no full-blooded negro has ever yet reached the highest rank in any department of human knowledge or activity.

The total negro population of Africa is vaguely estimated at about 180,000,000, and to this number must be added at least 20,000,000 of full-blood and half-caste negroes settled in other parts of the world.

**NEGRO MINSTRELSY.** Before the Civil War in the United States of America the slaves were noted for their musical qualities, and especially for numerous simple melodies, which, without any theoretical knowledge of music, they had managed to arrange for themselves out of old psalm tunes and home-made ditties. These songs were often accompanied by dancing and such instrumental music as they could obtain. Many "white folks" amused themselves by making collections of negro melodies, and by imitating their humble festivities. During the last forty years these melodies, and others of a more pretentious kind, though composed in the same simple style, have been introduced into fashionable society, with marvellous success. Originally the simple negro songs were closely imitated, as by the celebrated Ethiopian Serenaders about 1840, with their really beautiful "Lucy Neal," "Old Folks at Home," &c.; and the performers, white men disguised as negroes, closely imitated the negro dialect and characteristics. Later on these were in great part abandoned. The few performers and their simple banjos and fiddles gave way to large bands with many instruments and a numerous chorus, and the songs scarcely differed from ordinary drawing-room music except for the blackened faces of the singers. The "negro" entertainment, though thus extended out of all knowledge, still retains an enormous popularity.

**NEGUS,** a liquor made of port or sherry wine, hot water, sugar, lemon-juice or peel, and spices. It is so called from its first maker, Colonel Negus.

**NEHEMIAH** (i.e. "one whom Jehovah comforts"), son of Hachaliah, is variously described as a Levite, as of the tribe of Judah, and as a descendant of the royal house. He held the office of cupbearer to the Persian king, Artaxerxes Longimanus, about 444 B.C. Being sorely grieved by the miserable condition of his fellow-countrymen in Jerusalem, he obtained permission from the king to go thither as governor, and for twelve years (444-432 B.C.) laboured zealously to effect its re-establishment. He rebuilt the walls, provided for its internal administration, and insisted on a rigorous observance of the injunctions of the law. He then returned to Persia, but the work he had done fell into decay when his firm will and sagacious mind were withdrawn, and a second time he returned to the holy city to redress the abuses which had flourished during his absence. He probably remained at his post for ten or fifteen years, displaying an entire devotedness to his arduous task, and a noble zeal for the advancement of a pure religion. The date and place of his death are uncertain.

The book known under his name appears to have been only partly compiled by himself. The first seven chapters and the last chapter and a half are undoubtedly Nehemiah's, but the remainder is a compilation by other writers, arranged in its present form, perhaps, by the author of the "Chronicles." It supplies a vivid and forcible narrative of the principal events of Nehemiah's government, is written in a simple, energetic style, and bears no prophetic or mystical character.

**NEITH** was the Egyptian goddess the most nearly akin to the Greek Athēna in her attributes as the deity of the upper air and of the light of day, and hence the light of the mind. Athēna is akin in derivation to Ahana, the Sanskrit dawn-goddess. The Greeks used to explain away the likeness of the two deities by saying that they were in fact one, since ΝΗΘ (Nēth) read backwards was but ΘΗΝ (Thēn), and that would manifestly become Athēna in the softer Greek speech.

NEITH is the name given to the mysterious little sister planet or escaped satellite, whichever it is, which has been occasionally observed by the side of the planet Venus. Seven appearances of Neith have been registered since the invention of the telescope. The appearances have always been very transitory, and Neith has always been in the same phase as Venus whenever seen, but the conjunctions have been in very various parts of the orbit of Venus. The French astronomer Houzeau has calculated from the few observations recorded that five revolutions of Venus seem equal to four of Neith, and that the two are in conjunction about once in 1080 days. Neith was last seen on 3rd February, 1884, by M. Stuyvanert of the Brussels Observatory. "If," says M. Houzeau, as the result of his calculation, "we could remove the moon a little from the earth, and place her for a moment in opposition, she would cease to circulate round our globe, and would make her revolution as we do, round the sun;" and Neith would seem to have some such relation as this to Venus.

NELEUS, in the classical mythology, the father of Nestor (the embodiment of human wisdom in the Trojan War), was brother of Pélías, and son of the god Poseidón by Turó. The babes were cast out by their mother, eager to conceal her shame, but were brought up by shepherds, and eventually learning their parentage they seized the throne of Iolkos. They then quarrelling, Pélías drove Nélæus forth, and reigned alone. The latter ultimately became king of Pulos in Elis (or in Triphulia, it is uncertain which), and as he refused in this capacity to purify the demigod Héraklès for the murder of Iphitos, since Iphitos was a friend of his own, he incurred the anger of Héraklès, who slew all his sons save Nestor. Later on a further vengeance overtook his race, for the Hérakleids drove out the Nélæids from their home, and the latter took refuge in Athens.

NELLORE (Hindu *Nelluru*; *Nelli-uru*, the village of the *nelli* tree, *Phyllanthus emblica*), the chief town of Nellore district, Madras, is situated on the right bank of the Pennair, 107 miles north of Madras, and has a population of 30,000. Nellore is of considerable antiquity. Its ancient name was *Sinhapur* ("lion city"); later it was called *Durgametta*, a name which survives in one of its suburbs. In 1787, while a peasant was ploughing near the town, he struck upon the remains of a Hindu temple, beneath which was found a pot containing gold coins. About thirty of these were saved from the melting pot, and they were found to be Roman coins of the second century A.D., mostly bearing the names of Trajan, Hadrian, and Faustina.

Nellore is tolerably clean and airy. The houses are irregularly built, but there are some good streets occupied by the wealthier inhabitants. Since the establishment of the Municipal Commission in 1866, much has been done towards removing the most patent sanitary defects. The houses of the European residents are on the south of the town, along the bank of a large tank, on the further side of which rises the temple-crowned hill of Narasinha Konda. Nellore is connected with Madras by the Northern Trunk Road, and also by the Buckingham Canal.

NELSON, an episcopal city of New Zealand, and the capital of the provincial district of the same name, is prettily situated on the shores of a small harbour about 1180 miles from Sydney, 1410 from Melbourne, and 150 miles from Wellington. Nelson possesses a literary institute and museum, numerous public and private schools, a college, a cathedral, churches of various denominations, theatre, public hospital, lunatic asylum, and immigration barracks. The manufactories of the town comprise leather, breweries, hæmatite works, soap factory, and other industries. The population in 1881 was 6768; with the suburbs, about 9500. The city has a splendid supply of pure mountain water, and is under municipal government.

NELSON, HORATIO, Viscount Nelson (and Duke of Bronte in the peerage of Naples), the most renowned of English naval heroes, was born in the county of Norfolk on 29th September, 1758, at Burnham Thorpe, the village of which his father was rector. His great-grandmother, by the mother's side, was the eldest sister of Sir Robert Walpole the statesman, and Nelson was named Horatio after his godfather, the second Lord Walpole. He was the fifth son of a large family, and when he was nine lost his mother. He had received some schooling at Downham-Market in Norfolk, and afterwards at North Walsham, when in December, 1770, he entered the navy as a midshipman of the *Raisonné*, commanded by his uncle Captain Suckling. He remained on board of it only five months, when it was paid off after the settlement of the dispute with Spain about the Falkland Islands. Captain Suckling was removed to the *Triumph*, a guardship in the Thames, and such a life afloat being thought too idle for a boy, Nelson was sent a voyage to the West Indies in a merchantman commanded by a former officer of his uncle. After his return he joined the *Triumph*, stationed at Chatham, and in 1773 he obtained the post of coxswain on board the *Curacao*, Captain Lutwidge, in the exploring expedition towards the north pole which Captain Phipps, afterwards Lord Mulgrave, accompanied and has chronicled. After this voyage of novel experiences and hardships he was placed with Captain Farmer in the *Seahorse*, 20 guns, going out to the East Indies, where his health in eighteen months gave way, and he had to return home. On his arrival in England he found his uncle comptroller of the navy, and he was appointed acting lieutenant of the *Worcester*, 64, with which he went to Gibraltar and back. He had been now four years a midshipman. On the 9th of April, 1777, he passed a very creditable examination for a lieutenancy, and the day after he was appointed second lieutenant of the *Lowestoffe* frigate, Captain William Locker, then fitting out for Jamaica. To a war with her revolted American colonies, England added in 1778 one with France, and in 1779 with Spain. After distinguishing himself with the *Lowestoffe*, Nelson was recommended by its captain to Sir Peter Parker, then commander-in-chief on the West India station, who removed him to the *Bristol* flag-ship, and after some other changes he was made a post-captain on the 11th of June, 1779, a few months before he had reached the age of twenty-one. In 1780 he was commissioned to convey the transports and land the troops which were intended to take Fort San Juan on the San Juan River, which flows from Lake Nicaragua into the Atlantic, and then to cut off the communications of the Spaniards between their possessions in North and in South America, and by his gallantry he contributed to the capture of San Juan. The day before the surrender of the fortress Nelson left the expedition to take the command of the *Janus*, 44 guns, at Jamaica; but on arriving there, his health, much shattered by the climate of the isthmus, forced him to return to England. In August, 1781, he was appointed to the *Albemarle*, and after a cruise in the North Sea he joined the fleet under Lord Hood, with whom Prince William Henry, afterwards Duke of Clarence and William IV., was serving. Peace was concluded in January 1783; in July Nelson was in England, and presented by Lord Hood to the king. In March, 1784, he was appointed to the *Boreas*, 28 guns, going to the Leeward Islands as a cruiser on the peace establishment; and when he arrived in the West Indies he found himself senior captain, and second in command on that station. He was known previously as a brave and skilful officer, but it was now that he first displayed the moral daring which was one of his chief characteristics. The Americans were at this time trading with the West India Islands, taking advantage of the register of their ships which had been issued while they were British subjects. Nelson deemed the practice

both inimical to British interests and forbidden by the Navigation Act, as he construed it. He gave orders to enforce that Act. He was opposed by the governor of the Leeward Islands, by the planters *en masse*, and by the admiral himself. He seized some American ships, was prosecuted in the colonial courts, pleaded his own cause successfully; and the explanatory memorial which he addressed to the king was so satisfactory, that orders were sent from the home government that he should be defended at the expense of the crown. Amid the anxiety caused by the prosecution he made a marriage of affection. The lady was in her eighteenth year, the widow of Dr. Nisbet, a physician, and niece of Mr. Herbert, the president of Nevis. The marriage took place on the 11th March, 1787, Prince William Henry giving away the bride. War with France now arose, and on the 30th of January, 1793, through the influence of the Duke of Clarence and Lord Hood, he was appointed to the command of the *Agamemnon*, of 64 guns, and might have felt that at last was arriving the time for the fulfilment of his youthful vision of heroic destination. In the *Agamemnon* he joined the naval force sent under Lord Hood to the Mediterranean, but had no share in the operations at Toulon, in which Napoleon first distinguished himself, being sent with despatches to Sir William Hamilton, our envoy at the court of Naples, then and there forming an acquaintance with Lady Hamilton which unhappily ripened into a passionate attachment. Not long afterwards Nelson found himself for the first time in command of a squadron, and he was called on to aid Lord Hood in an attack upon the French in Corsica, which the English general disapproved of, and which Hood undertook on his own responsibility with the scantiest military aid. The surrender of Bastia, which took place 19th May, 1794, was largely owing to the courage and energy of Nelson, and after this event he was sent to co-operate, again successfully, with Sir Charles Stewart in reducing Calvi, in the attack on which a shot struck the ground near him, driving the sand and gravel into one of his eyes, of which the sight was lost. Lord Hood returned to England, and was succeeded by Admiral Hotham, during whose chase of the French Toulon fleet Nelson engaged with and captured (18th and 14th March, 1795) the *Ca Ira*, 84 guns, and *Le Censeur*, 74, after a gallant fight on both sides—the admiral, to Nelson's great dissatisfaction, refusing to follow up the success and continue the chase. He was sent next to blockade Genoa, with a squadron of eight frigates; and he superintended—to him a melancholy occupation—the British evacuation of Corsica, Sir John Jervis, better known as Earl St. Vincent, having meanwhile taken the command of the Mediterranean fleet. Commodore Nelson, as he now was, hoisted his broad pendant on board the *Minerva* frigate, and on the 19th December, 1796, took, after a gallant fight, a Spanish frigate, the *Santa Sabina*. On the 18th of February, 1797, he joined the fleet under Sir John Jervis, just in time to be present at the battle of St. Vincent, and was ordered to shift his pendant on board the *Captain*, 74. The battle began at daybreak of the 14th. It was the first engagement in which Nelson had an opportunity afforded him of displaying, on a scale worthy of them, some at least of his great naval qualities. He began by disregarding a particular signal, to obey which might have been fatal to success, and as a result of his disobedience he found his ship engaged with seven of the enemy's, among them the *Santisima Trinidad*, 136 guns, and the *San Joseph* and the *Salvador del Mundo*, both of them 112. After some fighting, Nelson was abreast of and close alongside the *San Nicholas*, 80 guns, with his own ship the *Captain* completely disabled. He at once gave orders to board, and himself leaped in through the upper quarter gallery window. When the English were in possession of the ship, a fire was opened upon them from the *San Joseph*, which was lying on the

other side of the *San Nicholas*. Nelson ordered the *San Joseph* to be boarded from the *San Nicholas*, and himself led the way, exclaiming, "Westminster Abbey or victory!" On the quarter-deck he received the swords of the captain and other officers, while the Spanish admiral was dying of his wounds below. With all the four ships which were taken in this victory Nelson was engaged; two of them he took himself, and it was his daring disregard of the signal that converted the action into a victory. Nelson had been appointed a rear-admiral before the news of the action reached England, and then he received the order of the Bath, and became Sir Horatio Nelson. Hoisting his flag as rear-admiral of the blue on board the *Theseus*, he was employed in the command of the inner squadron at the blockade of Cadiz. He headed an expedition against Teneriffe, and on the night of the 24th April, 1797, he was landing in the face of the enemy's fire to aid in the attack, when stepping out of the boat he received a shot through the right elbow and fell. The attack failed, which grieved Nelson more than the loss of his right arm, which it was necessary to amputate. The wounded hero returned to England, where new honours awaited him. He received the freedom of the cities of London and Bristol, and a pension of £1000 a year. "The memorial," says Southey, "which as a matter of form he was called upon to present on this occasion, exhibited an extraordinary catalogue of services performed during the war. It stated that he had been in four actions with the fleets of the enemy, and in three actions with boats employed in cutting out of harbour, in destroying vessels, and in taking three towns; he had served on shore with the army four months, and commanded the batteries at the sieges of Bastia and Calvi; he had assisted at the capture of seven sail of the line, six frigates, four corvettes, and eleven privateers; taken and destroyed near fifty sail of merchant vessels, and actually been engaged against the enemy upwards of 120 times; in which service he had lost his right eye and right arm, and been severely wounded and bruised in his body."

Early in 1798 Nelson hoisted his flag in the *Vanguard*, with orders to rejoin Earl St. Vincent, the new title bestowed on Jervis for the victory in which Nelson had a principal share. A great expedition was then fitting out by the French at Toulon, and Nelson, whose achievements were now beginning to be acknowledged, was despatched to watch it. Stress of weather drove him to Sardinia, where he was strongly reinforced. On the 22nd of June he heard that the French had left Malta after seizing it, and he divined that their course was for Egypt. On the 1st of August he came in sight of Alexandria, and in the afternoon the enemy's fleet was visible. The French fleet, under the command of Admiral Brueys, was moored in Aboukir Bay, in a compact line of battle, "the headmost vessel being as close as possible to a shoal on the north-west, and the rest of the fleet forming a kind of curve along the line of deep water, so as not to be turned by any means in the south-west." It consisted of "thirteen ships of the line and four frigates, carrying 1196 guns and 11,230 men. The English had the same number of ships of the line and one 50-gun ship, carrying 1012 guns and 8068 men. The English ships were all of 74 guns; the French had three 80-gun ships, and one three-decker of 120." "The moment," Southey continues, "he perceived the position of the French, that intuitive genius with which Nelson was endowed displayed itself; and it instantly struck him that where there was room for an enemy's ship to swing there was room for one of ours to anchor. The plan which he intended to pursue, therefore, was to keep entirely on the outer side of the French line, and station his ships, as far as he was able, one on the outer bow and another on the outer quarter of each of the enemy's." The action commenced at sunset of 1st August, 1798, and terminated about six a.m. the next day. Soon after nine p.m.

of the 1st the admiral's ship *L'Orient*, in which Brucys himself was dead of his wounds, took fire, and in an hour blow up with an immense explosion. Before this, Nelson himself had received a severe wound in the head from a piece of laugrage shot, and was carried below, but roused himself to go on deck when he heard that *L'Orient* was on fire, and gave orders, with his usual humanity, that boats should be sent to the assistance of the enemy. When the battle was over only four vessels of the French fleet had escaped; "the British loss," Southey\* computes, "in killed and wounded, amounted to 895: 8105 of the French, including the wounded, were sent on shore by cartel, and 5225 perished." The news of the great victory was received in England with boundless delight, and it marks a new epoch in British naval history. From this period it was impossible to question the supremacy of England on the seas, and there can be no doubt that the moral effect of this victory contributed largely to defeat the design for the invasion of England afterwards conceived by Napoleon. As a reward for his services the victor was raised to the peerage as Baron Nelson of the Nile and of Burnham Thorpe, with a pension of £2000 for his own life and those of his two immediate successors. The next year of Nelson's life was busy and eventful, but not one over which even an admiring biographer would linger. It was spent by him in efforts to restore the authority of the King of the Two Sicilies, overthrown by a coalition between the French and the native republicans, wearied of Bourbon tyranny. Nelson's honest sailor-mind saw clearly enough the badness of the Neapolitan system of government; but his hatred of the French naturally dominated every other feeling, and with the spell of the Armida Lady Hamilton upon him, he consented to the judicial murder of Caraccioli, which even Southey pronounces to be "a deplorable transaction, a stain upon the memory of Nelson and the honour of England." Nelson delivered Naples from the French, and received as a reward the dukedom and domain of Bronte, worth about £3000 a year. Towards the close of 1800 he had returned to England with his now indispensable friends, Sir William and Lady Hamilton. His attachment to the latter was at its height, and in three months after his return he was separated from his wife, an event which his triumphant reception at home cannot obliterate. On the 1st of January, 1801, he was appointed vice-admiral of the blue, and on the 12th of March he sailed as second in command under Sir Hyde Parker on the Copenhagen expedition. Russia, Denmark, and Sweden had united to forward the views of France, and to force England to resign her naval rights. It was to destroy this confederacy of the northern powers that the expedition was undertaken of which Nelson, though nominally its second in command, was really the guiding soul. The Sound was passed, and the attack on the Danish fleet at Copenhagen was intrusted, at his own request, to Nelson. The action commenced at ten o'clock on the morning of the 2nd April, 1801. "The Danish force," says Mr. Pettigrew, "consisted of six sail of the line; eleven floating batteries, mounting from twenty-six 24-pounders to eighteen 18-pounders, and one bomb-ship, besides schooner gun-vessels. These were supported by the Crown Islands, mounting eighty-eight cannon, and four sail of the line moored in the harbour's mouth, and some batteries on the island of Amak. Our force consisted of twelve sail of the line, four frigates, four sloops, two fire-ships, and seven bombs. Three of the sail of the line were not in action, being on shore," a circumstance which added much to Nelson's anxiety at the beginning of the engagement. His responsibility was increased when at one o'clock, the result of the battle being still undecided, the commander-in-chief made signals for the action to cease. "Leave off action?" said Nelson, when the signal was reported to him; "now d—n me if I do!" and sarcastically putting his telescope to his blind eye, he said, "I can-

not see the signal, keep nine for closer battle flying," and the conflict, one of the fiercest in the annals of naval warfare, was continued. At two o'clock the fire of the *Dagges* had ceased from the greater part of their line, and soon this great victory was complete. Denmark agreed to an armistice; Sweden, already lukewarm, was cowed; and the death of the Emperor Paul of Russia gave the finishing stroke to the northern confederacy. For the victory at Copenhagen Nelson was created a viscount, and received the thanks of both Houses of Parliament. On his return to England he was appointed to a command extending from Orfordness to Beachy Head, that he might watch and baffle the preparations of Napoleon for the invasion of England. After the peace of Amiens he spent some time in retirement at Merton in Surrey, where he had purchased an estate, and where he enjoyed the society of Sir William and Lady Hamilton. On the renewal of hostilities with France he was appointed commander-in-chief on the Mediterranean station, and being sent to blockade Toulon he hoisted his flag on board the *Victory* in May, 1803, and from that date to August, 1805, he only quitted his ship for three hours. In the January of 1805 war was declared with Spain, and in the same month the Toulon fleet under Villeneuve, to co-operate with the Spaniards, put to sea. Stress of weather forced the French to return to Toulon, from which, however, they issued again on the last day of March. Nelson followed without meeting them to the West Indies and back again, and was for a time recruiting at Merton, when in the first days of September, 1805, news was brought him that the combined French and Spanish fleets, after an indecisive action with Sir Robert Calder's squadron on the 22nd of July, had entered Cadiz in safety. His offer to go and fight them, made at once, was at once accepted. On the 29th of September, his birthday, he arrived off Cadiz, and on the morning of the 19th of October it was signalled that the combined fleets were coming out of port. After two days of manœuvring the decisive hour arrived. At daybreak of the 21st of October, 1805, the combined fleets of France and Spain were formed in double line, in such a position as to bring the shores of Trafalgar and St. Pedro under the lee of the British, while the port of Cadiz was kept open to themselves. The British fleet consisted of three of 100 guns, four of 98, one of 80, sixteen of 74, and three of 64, being twenty-seven sail of the line, together with four frigates, a schooner, and a cutter. The combined fleets consisted of—French, four of 80 guns, and fourteen of 74; Spanish, one of 130, two of 112, one of 100, two of 80, eight of 74, and one of 64, making thirty-three sail of the line, and five French frigates and two brigs. "Their superiority," says Southey, "was greater in size and weight of metal than in numbers. They had 4000 troops on board, and the best riflemen who could be procured, many of them Tyrolese, were dispersed through the ships. Signal was made to bear upon the enemy in two lines, and the fleet set all sail. Collingwood, in the *Royal Sovereign*, led the line of thirteen ships; the *Victory* led the weather line of fourteen." Nelson retired to his cabin, and after writing a prayer for victory, commended also in writing Lady Hamilton and his adopted daughter, Horatia, to the care of his king and country. At half-past eleven a.m. he made his memorable signal. "England expects every man to do his duty," which was received with a noble burst of cheering from the whole fleet. Nelson went into action wearing on the left breast of his admiral's coat the stars of the different orders with which he was invested, and thus made himself a mark to the enemy. A little after twelve, Collingwood having begun the action, Nelson was told that it was not possible to break the enemy's line without running on board one of their ships, and the *Victory*, which had been exposed to a raking fire, ran on board the *Redoubtable*. "A ball fired from her mizzen-top, which in the then situation of the

two vessels, was not more than 15 yards from that part of the deck where he was standing, struck the epaulette on his left shoulder about a quarter after one, just in the heat of the action. He fell upon his face, on the spot which was covered with his poor secretary's blood." He lingered in pain below for three hours and a quarter, dying at thirty minutes past four, and not before he had received truthful assurance that he had gained a complete victory over the enemy. His last words, repeatedly pronounced, were—"Thank God, I have done my duty." So, in the moment of victory fell Nelson, to quote the words of the poet-laureate, "the greatest sailor since the world began," who joined the tenderness and sensibility of the woman to the valour and daring of the hero—brave, unselfish, humane, patriotic. A public funeral was decreed him, and on the 9th of January, 1806, his corpse was borne with every demonstration of honour to its resting-place in St. Paul's Cathedral. "When he died," says Coleridge finely, "it seemed as if no man was a stranger to another; for all were made acquaintances by the rights of a common anguish." His committal of Lady Hamilton to the care of his country received but scant attention, and she subsequently had to flee the kingdom to escape imprisonment for debt, and after two years spent in the deepest poverty she died at Calais, 18th January, 1815.

Of the older biographies of Nelson the best is the compact and classical performance of Southey. "Nelson's Despatches and Letters," edited by Sir Harris Nicolas, were published in seven volumes in 1844-47. The substance of them, well selected and arranged, with some additional matter, is given in "Letters and Despatches of Nelson," by J. Knox Laughton (London, 1886). See also the French biography of De Forques (1860) and that of Lamartine (1863).

**NELUMBium**, a genus of plants belonging to the order NYMPHÆACEÆ. *Nelumbium speciosum* (Pythagorean bean) is native in slow-running streams and tranquil waters in the warmer parts of Asia. The flowers are very beautiful, smelling of anise, and generally of a rose colour, seldom white. A variety of this species, *Tamara*, is native of Malabar. It is one of the plants supposed to be the Lotus of antiquity, formerly found in Egypt. It is spoken of as having been used as food by the Egyptians. Both roots and seeds are esculent, and are accounted cooling and strengthening, and of service in diarrhoea. The seeds are somewhat of the size and form of an acorn, and of a taste as delicate as that of almonds. *Nelumbium luteum* is a native of the southern part of North America, in lakes and ponds; it has been naturalized as far north as Philadelphia. The flowers are yellow, and resemble a double tulip. The seeds are very agreeable to eat, and are much relished by the Indians and children.

**NEMATELMINTHA** is a class of the somewhat heterogeneous subkingdom VERMES. Comprising two orders, NEMATODA and ACANTHOCEPHALA, the latter containing only one genus, *Echinorhynchus*. In this class the body is elongated, cylindrical, or thread-like, without any appendages, but often furnished at the anterior extremity with hooks or papillæ, serving for attack or attachment. They generally possess a body cavity, but blood-vessels and respiratory organs are absent. The Acanthocephala have neither mouth nor alimentary canal. A nervous system is always present, and eye-spots not unfrequently. The sexes are generally separate and development direct. Most are parasites. The remarkable worm SAGITTA, forming the class Chætogonatha, is sometimes placed in this class.

**NEMATODA** or **NEMATOIDÆA** is a group of wormlike animals usually regarded as forming, together with the Acanthocephala, the NEMATELMINTHA, a class of the subkingdom Vermes. The Nematodes or thread-worms have an elongated threadlike body, unsegmented and without appendages, but provided with a horny cuticle,

which is raised into spines and hooks especially round the mouth. The mouth leads into a thick-walled suckorial pharynx with a horny lining, which in some genera forms toothlike prominences. The pharynx is followed by a straight intestine, opening near the end of the body at the anus. Beneath the epidermis is a layer of muscles which does not completely invest the body, but is interrupted by certain spaces, of which the two chief are known as the lateral lines; each of these incloses a canal with contractile walls and clear contents, which opens to the exterior in the mid-ventral line near the junction of pharynx and intestine. The lateral lines are excretory organs. The nervous system consists of a nerve-ring surrounding the œsophagus, from which proceed two cords to the end of the body and nerves to the region of the head. Some of the free forms have eye-spots. There is a body cavity, but no vascular system. The sexes are usually distinct. The males are generally smaller than the females, and have the posterior end of the body curved. The female genital aperture is near the middle of the body, the male near the end. The spermatozoa are very remarkable in having the form of cells which exhibit amœboid movements. The females are usually oviparous, but in some cases the young are hatched inside their mother's body.

The nematodes are usually parasitic. Some, however, are never parasitic, but live in water or damp earth, especially in decaying substances. These free forms, which belong to the family Anguillulidæ, are all minute, and retain their vitality for a long time when dried. Of the parasitic forms some are free at some period of their life-history. The larval and adult stages are often, as with many parasites, passed in two different animals. Others, as the Trichinæ, inhabit the same host in both stages but different parts of his body. The adult nematode is usually parasitic in some portion of the alimentary canal, while the larva lives often in tissues. The nematodes usually feed on organic juices, but some feed also on blood. They progress by means of a rapid undulatory movement of the body.

The family Ascaridæ contains two common human parasites, the Round-worm (*Ascaris lumbricoides*), which looks like a pale earthworm, and is found in the small intestine, and the Thread-worm (*Oxyuris vermicularius*), which inhabits the large intestine and cæcum. The Strongylidæ contain many parasites, which are found in the bronchial tubes of mammals, but do not usually attack man. The Trichinidæ contain the well-known and formidable parasite, *Trichina spiralis*, which occurs encysted in the muscles of pigs, and being carried into man's alimentary canal in badly cooked pig's flesh attains sexual maturity, and gives birth to thousands of young, which bore their way into the tissues, producing the terrible disease Trichinosis. [See TRICHINA.] The Filariidæ contain the GUINEA-WORM (*Filaria medinensis*), which lives in the connective tissue of man, and *Filaria sanguinis hominis*, living in great numbers in human blood. The Gordiidæ or Hair-worms [see GORDIUS] have no mouth, a very rudimentary alimentary canal, and no lateral lines. The larvæ, parasitic within the bodies of insect larvæ, are swallowed together with their hosts by predatory aquatic insects, undergo further development, and finally become free and mature. The Mermithidæ are also insect parasites, and have a rudimentary digestive system. The Anguillulidæ are for the most part free forms; *Anguillula scandens* is parasitic in ears of wheat, causing BLIGHT.

**NEMEAN GAMES**, one of the four great national festivals of the Greeks, derived their name from Nemea, a valley in the north-eastern part of Argolis. The games were first founded, so tradition ran, by the "Seven against Thebes" [see THEBES], and were renewed by Hēraklēs to celebrate his victory over the lion in this valley. A splendid temple was raised in later times to Zeus Nemeios,

and the games took place in honour of Zeus in the neighbouring grove. At first they were exclusively military, but afterwards any free Greeks might take part. Racing, boxing, and feats of arms were interspersed with contests in poetry and music, and the victors in each department received a crown of parsley leaves, or in the earlier times of olive leaves.

**NEMERTINE** is a group of worms distinguished by their size, elongated ciliated body, and by the presence of a retractile proboscis. The Nemertines are now separated from the Planariæ, with which they were till recently associated, and form a separate order of the class PLATYELMINTHA or Flat-worms. The nemertines are principally marine forms, lurking in the mud or under stones. They have a very long eversible proboscis, contained in a special sheath distinct from the body-cavity and opening in front of the mouth. This proboscis-sheath contains a corpuscular fluid, the compression of which causes the proboscis to evert. The whole of the proboscis is never everted, the hinder part being solid and muscular, and attached to the wall of the proboscis-sheath. It is introverted, as if one were to push in the finger of a glove from the top inwards. The everted portion is either armed at the tip with a sharp silicious stylet, or has its surface provided with "nematoocytes" or thread cells similar to those of the Hydrozoa, which discharge stinging rods. The proboscis has both a tactile and aggressive function; it is often shot out so forcibly that it is detached from its sheath; even then it may retain its vitality for some time, creeping about like an independent worm.

The opening of the mouth is distinct from that of the proboscis-sheath; it leads into a straight sacculated alimentary canal ending in an anus. The nervous system attains a high development, and a circulatory system is present. Excretory organs, in the form of a pair of coiled tubes, are found. The sexes are usually distinct. The development in some species is direct, but in others a special larval form, the Pilidium, appears. The pilidium is a free-swimming ciliated larva, shaped like a helmet with ear-lappets and spike, the last being either a strong flagellum or a tuft of cilia. Round the alimentary canal of this larva the nemertine worm is gradually formed, till at last it breaks through the larval skin. Some of these nemertines attain an enormous length, the Sea Long-worm (*Lineus longissimus*) being 14 feet long. Some secrete gelatinous tubes in which they live. They feed chiefly on the polychæte worms which inhabit tubes. Some, as *Malacobdella*, are parasitic in bivalve molluscs. All the nemertines are very tenacious of life, and readily reproduce mutilated parts, such as the proboscis.

**NEMESIS**, a female Greek divinity, who appears to have been regarded as the personification of the righteous anger of the gods. She is represented as inflexibly severe to the proud and insolent. According to Hesiod she was the daughter of Night. There was a famous temple sacred to her at Rhamnus, one of the demes of Attica, about sixty stadia distant from Marathon.

**NEMOCERA** is a suborder of DIPTERA, or two-winged insects. The insects contained in this suborder generally have an elongated form, long slender legs, and large wings. The antennæ are threadlike and composed of many joints; they are sometimes, especially in the males, fringed with long hairs. The palps have four or five joints. The proboscis, except in the Culicidæ, is short and fleshy. The larvæ have a perfectly distinct head; they are often aquatic, but others live in galls. This suborder contains the gnats (Culicidæ), the midges (Chironomidae), the daddy long-legs or crane-flies (Tipulidæ), the Mycetophilidæ, whose larvæ feed in fungi, the gall-midges (Cecidomyidæ), the Psychodidæ with hairy wings and body resembling moths, and the Bibionidæ, which resemble the flies of the family Muscidæ. The families Culicidæ and

Bibionidæ (Simulium) are bloodsuckers, and cause great annoyance in hot countries.

**NENNIUS**, a monk of Bangor, who seems to have lived in the first part of the ninth century. He wrote a Latin history of Britain, styled "Eulogium Britannicæ," which appears to have been sadly mutilated and interpolated by an ignorant transcriber, who signs himself "Samuel," and "a disciple of Beularius Presbyter." Arthur and his twelve battles at the head of the Britons are spoken of. The oldest MSS. are of the twelfth century. Nothing is known of Nennius, and for all practical purposes he is useless.

**NEOCOMIAN**, in geology, is the name applied to the lower division of the Cretaceous. The term is derived from Neocomium, the ancient name of Neuchâtel in Switzerland, where the strata are very well developed, and separated into three divisions; in this district and in other localities on the Continent the strata are of marine origin. In Great Britain this type of formation is altogether subordinate to the fluviatile and estuarine type. In the North British area Neocomian strata of marine origin occur at Fife Bay in Yorkshire, but of diminutive thickness. This **SPIERTON CLAY**, as it is called, is about 500 feet thick, and is capable of being separated into three divisions, lower, middle, and upper Neocomian, characterized by zones of special fossils, and corresponding with similar divisions on the continental area. The great thickness of beds of this age in England belong to the type of the southern district; they extend from the estuarine beds of the Purbeck through the Wealden upwards to the top of the Lower Greensand, which is in part marine and contains fossils that are characteristic of upper Neocomian rocks. The Purbeck-Wealden series is considered to be the equivalent of the lower and middle divisions, the Weald clay probably representing the latter.

**NEOGENE**, a term sometimes employed by Continental geologists to denote the Tertiary strata now commonly subdivided, and referred to as **MIOCENE** and **PLIOCENE**.

**NEOLITHIC** is the name applied to the later division of the stone age, when early man had adopted polished stone implements, and kept domestic animals. See **STONE AGE**.

**NEO-PLATONISM**. A combination of Hellenic and Oriental elements into a philosophical religion rather than a philosophy, arose in Alexandria at the close of the second century. In common with the Jewish-Greek philosophers, such as Philo of Alexandria, and the Neo-Pythagoreans, the Neo-Platonists held the dualistic opposition of earthly and divine things—an abstract conception of God, excluding all actual knowledge of the divine nature (the *agnostic* position), though admitting a sort of revelation called the "ecstasy;" a contempt for the world of sense, as the soul was held to have descended from a superior world when it became linked with the body; a belief in the existence of intermediate beings or divine states by whom God produces phenomena; and the need for the ecstatic state aforementioned, to be attained by ascetic practices, when the soul, emancipated from earthly restraints, was intimately in communion with God.

Ammonios Sakkas (175-250), a mere porter who carried bales, as his nickname shows, brought up as a Christian, returned to the older faith when he had become learned, and founded this school, the germs of which may be traced to the teaching of the Jew Philo. He was the teacher of the great Plôtinos, who really developed and organized it into a lofty faith, which became a perilous rival to Christianity. Plôtinos (203-262) taught at Rome, and his works were edited by Porphyry (Porphyrios). Although he believed he had Plato's authority for his teaching, he manifestly goes far beyond his master, and especially where Plato styles the Platonic ideas gods, and the idea of the Good the highest god; for Plôtinos teaches



that beyond the Platonic ideas and above them lies the one, the Good and Wise, from whom these ideas (or universals) are but emanations. The origin of the world, the fundamental problem of philosophy, was settled by Plótinus thus: God made the world; but he could not make it out of nothing, and as in the system of Plótinus God included all the universe, he must have made it out of his own substance. It is identical with him in essence, though not in act; it is, in fact, the manifestation of his intelligence. God is the only existence; we and all material things are but phenomena of his existence. God is entirely beyond our knowledge, for how can the finite and temporary grasp the infinite and eternal? But, pleads Plótinus, by long trains of thought or by asceticism, by love, by prayer, or by music the soul may be so purified as to shake off its mortal coil for a few brief moments, and to realize its identity with God. This is the state of ecstasy. Porphyry, his pupil, admits that Plótinus himself attained it, so far as he knew, only a few times. And yet no one could be more eager than he to be quit of the body. He used to say he "blushed that he had a body," and when he lay in his death-agony he exclaimed, "I am struggling to free the divinity fettered within me."

By the most rigorous use of the Platonic dialectics Plótinus arrived at his famous conception of God's nature as a Trinity. An angry dispute long raged as to whether the Christians or the Neo-Platonists were the first to formulate the Triune nature of God, each asserting that the other had copied its highest dogma (see M. Jules Simon's compendious "History of the Schools of Alexandria," vol. i. pp. 308-341). Plótinus argued thus: the whole eternally active world is seen to be manifestly governed by intelligence by any one who meditates upon the causes of phenomena. Intelligence and activity are therefore the attributes of God, the soul of the universe. All living things are his manifestation. But intelligence and activity are attributes of mind; and therefore beyond the soul of the universe there must lie a divine mind, the *Nous* or eternal thought, whence arise the divine intelligence and activity constituting that soul; and this second person of the Godhead, the *Nous*, is also manifested, not in the world of sensible things, but in that of insensible things, the motionless incorporeal abstractions and ideas, images of the eternal truth and thought whence they arise. But Plótinus pushes further. Thoughts demand a thinker and a something thought of, a self and a not-self; even this lofty abstraction of the divine mind cannot therefore be the inmost nature of God, since nothing can be external to him. The third and highest person of the Godhead is therefore Unity, neither existence, nor thought, nor anything that can be conditioned or predicated, the Absolute Non-being, as Proklos calls it (μὴ ὄν), though it may not be called Nothing; or, to use Hegel's phrase (and Hegel is practically at one with this phase of Neo-Platonism), the first person of the Godhead is the Immanent Negative.

Plótinus was followed by his pupils, Amelios and the famous Porphyry (233-305), the latter taking up a distinctly anti-Christian position, and writing a long treatise against Christianity, in fifteen books. Unfortunately this was publicly destroyed by the Emperor Theodosios, and we are unable to gather its tenor. Coming from so learned, good, and philosophical a writer as Porphyry, it would have been deeply interesting as showing the attitude of the best pagans towards the higher faith. The works of Porphyry are elegant and imaginative, though obscure; and it was considered that in collecting and editing the works of Plótinus he improved them in style and clearness.

Iamblichos, a native of Coele-Syria (died about 330), pupil of Porphyry, used Neo-Platonism and a large part of the Pythagorean speculation on number as dialectical weapons in favour of polytheism. He even added to the already large number of pagan gods from his stores of

Oriental knowledge. With him and after him the theurgic side of the question became rampant, and he styled himself High Priest of the Universe, affecting, moreover, to work miracles. Immoderate veneration for the great teachers (especially for Iamblichos himself) soon prevailed. Among the disciples of Iamblichos were *Ædésios*, *Chrysanthios*, *Maximus*, *Priscus*, *Eusébios*, *Sópater*, *Sallustius*, and the Emperor Julian, who reigned from the end of 361 to the midst of 363. Julian strove hard, but in vain, against the all-conquering stream of Christianity; and after his death and the confirmation of Christianity as the state religion, the Neo-Platonists took refuge in a renewed study of science and criticism, especially of Aristotle and Plato. Plutarch, the son of Nestórios (died about 433), and his pupil Surianos, and their disciples, Hieróklés of Alexandria and Proklos (Lat. *Proclus*), born at Constantinople A.D. 412, are the chief of this latter school of the later Neo-Platonists, which was held at Athens. With Proklos faith is definitely placed above science, and reason becomes the expositor of belief. That is to say, philosophy is abandoned. Marinos, Asklepiodotos, and Hegias were pupils of Proklos, and Damaskios followed them as president of the school till 529, when the Emperor Justinian forbade any further instruction in philosophy at Athens. All the leaders emigrated to Persia, but failing to find freedom of opinion there they returned to Greece. After this nothing remained but to prepare the careful commentaries on Plato and Aristotle which carried Greek philosophy through the dark ages.

In the reign of Charles I. a curious and very interesting writer, the Rev. Dr. Henry More (1614-87), who declined preferment in the church that he might devote himself to working out his ideals, endeavoured to combine the teachings of Neo-Platonism with those of Christianity, in what he called a "Christiano-Platonick Display of Life" (1642), a work which is none the clearer for being in verse. Christian Platonism, however, interesting as it is as a curiosity, never took root, and perhaps More never had a disciple.

**NEOPTOLÉMOS** (also called *Purros*, possibly because he had red hair), the son of the famous Achilles, was so called because he came late into that war (Gr. *neos*, late; *polemos*, war). His presence was necessary to terminate it, so oracles declared; and Odusseus therefore brought him over to Asia from the court of his grandfather Lukomédés. He was one of those who were concealed within the wooden horse, and it was he who killed the aged King Priam of Troy. At the fall of Troy he received Andromaché, the widow of Hektór, as part of his share of the booty. He married as his second wife Hermione, daughter of Menelaos, and soon after this marriage was murdered at Delphi; but why he had gone there or why he was murdered is uncertain. Half a dozen accounts are given. He was worshipped at a shrine there as a hero.

**NEO-PYTHAGOREANS.** Cicero names, as the first renewer of Pythagoreanism, P. Nigidius Figulus, of Alexandria (about B.C. 60); and the school thus continued under Augustus, producing several works falsely attributed to the earlier Pythagorean school. A branch of the Eclectics, led by Sotión, also took up Neo-Pythagorean doctrines. But the chief leaders were Apollónios of Tyana, and Moderatus of Gades, who flourished in the time of Nero, and Nichomachos of Gerasa in Arabia, who lived under the Antonines. The latter's teaching has been preserved for us better than that of his companions. Phótiós quotes his explanation of the numbers up to ten:—*One*, as meaning God, reason, goodness, unity, form, &c.; *two*, as meaning matter, evil, duality, change, &c., and so on; and we learn that the ethical problem is only to be solved by retirement from contact with impurity, and the search for reunion with God.

Apollónios is so transfigured by the romance of Philos-



tratos, which he wrote to amuse the Empress Julia Domna, wife of Septimius Severus, that it is difficult to gather the truth as to his teaching. A fragment preserved by Eusebius tells us that Apollonius distinguished between the gods of Olympus and the one God who exists behind and beyond all things and all gods; who, unlike them, needs no sacrifices and no worship, who ought not even to be named, but only apprehended by meditation and the reason. All earthly things, ourselves included, are too impure to approach the supreme deity.

**NEOTTIA**, a genus of plants belonging to the order ORCHIDACEÆ. *Neottia Nidus-avis* (bird's-nest orchis) is the only British species of this genus. The whole plant is of a pale reddish-brown; the root formed of many thick fleshy fibres, from the extremities of which young plants are produced. The stem is about a foot high, with sheathing brown scales. It has no leaves.

**NEOZOIC** (from Gr. *neos*, new, and *zoe*, life) is the name applied to the later subdivision of geological time, wherein the modern types of animals appeared, and during which the organic world has assumed its present aspect: it embraces both the Mesozoic and Cainozoic Eras.

Geological time is thus separated into two main divisions, the Palæozoic, or the epoch of ancient life, and Neozoic, or epoch of new or modern life; a great contrast exists between the two. The Palæozoic was essentially an age of invertebrates, only towards its close did the vertebrates appear, and then only the lower orders. During Neozoic time, although the invertebrates continue in great numbers of remarkable diversity, yet differing largely from those of the Palæozoic, they are inferior in size and power to the vertebrates, which since their introduction have kept on steadily assuming more and more importance. The contrast that exists in many of the orders of animals is also striking. Neozoic corals have their radiating septa in multiples of five or six (Sesquialtera); only a few of the rugose (Quadrifaria) corals linger on to the cretaceous. Neozoic echinoderms are mostly free, as the Echinoids and Asterozooids;

but the stalked forms, crinoids, also occur—these, however, have plumose or feathered arms, contrasting strongly with the compact cystids and blastoids of the Palæozoic. Among the Mollusca, although during the earlier Neozoic, the lamellibranchs and brachiopods exist in about equal numbers, yet during the later stages and in modern times the former vastly predominate; several genera are figured in the Plate, as



*Cidarites intermedius*, an Echinoid from the middle Oolite formation.

*Ostrea*, *Pholodomya*, *Pecten*, *Mya*, *Trigonia*, *Venericardia*, and *Cytherea*. Neozoic lamellibranchs have mostly a posterior breathing siphon, Neozoic brachiopods have sloping shoulders, like the genera *Terebratula*; the Palæozoic forms had mostly a straight hinge and square shoulders, like the genus *Productus*. Land and fresh-water gasteropods appear in Neozoic time in addition to marine forms previously prevalent. Carnivorous gasteropods (marine) with beaked shells were in the ascendant during this era; several genera are figured in the Plate, as *Trochus*, *Cypræa*, *Volva*, *Turbo*, and *Murex*. The Cephalopoda had an extraordinary development during the earlier Neozoic. The Dibranchiata are peculiar to this era, and during the later stages and in modern seas they predominate over the Tetrabranchiata. Of the latter or shelled cephalopods only coiled forms are found in the Neozoic; Ammonites, figured in the Plate, is the most abundant genus. Belemnites, also figured, represent the Dibranchiata division. The Crustacea are represented in the earlier stages by *Macrourans*, which are supplemented later on by *Brachyoursans* or our modern

short-tailed crabs. The ancient order of Trilobites have no representatives.

Among the Vertebrata, the fishes and amphibians of the Palæozoic become quite subordinate to the reptiles, mammals, and birds, which successively make their appearance in the Neozoic. The ganoid and placoid fish of the Palæozoic, though still represented, become gradually supplanted by the prevalent modern teleostean or bony fishes.

**NEPAL**, a native kingdom, occupying the southern ranges of the Himalayas, beyond the northern boundary of British India. It extends from 26° 25' to 30° 17' N. lat., and from 80° 15' to 88° 15' E. lon., and is bounded on the north by Tibet; on the east by Sikkim and the British district of Darjeeling; on the south by the British districts of Basti, Gorakhpur, Chumprun, Mozufferpore, Durbhunga, Bhagalpur and Purneah; on the south-west by Oudh, and on the west by the British district of Kumaun. Its length from east to west is about 550 miles, and its breadth about 160 miles, having an area of about 84,500 square miles. The principal territorial divisions are Murang, Chaynpur, Makmani, Khatang, Nepal Proper, Gurkha, Khachi, and Malibum. The territory exhibits great diversity of surface and climate, and corresponding differences of vegetable and animal life; it is traversed by several considerable streams, and is divided into five parallel zones. The principal rivers which traverse Nepal are the Karnali, Gandak, Trisul-Ganga, Bori-Gandak, Kosi, Gogra and Bagmati, most of them rising in the highlands of Tibet. Along its southern border extends the *Tarai*, a long narrow strip of marshy forest and jungle, about 20 miles broad; beyond this is a forest region producing a great variety of valuable timber. Beyond this again the country becomes more hilly and continues to rise in terraces. Still further north these begin to assume a mountainous character, beyond and above which rises the great Snowy Range, where are found Mount Everest (29,002 feet), Dhaulagiri (26,862 feet), Goshathan, Kanchinjunga (28,156 feet), and others, the highest peaks in the world. Among the mountains are several inhabited valleys, varying in height from 3000 to 6000 feet above the plains of Bengal. Of these the valley of Nepal Proper is perhaps the largest, being 12 miles long and 9 miles broad. It is bounded on all sides by lofty mountains, and its undulating surface is covered with a rich expanse of cultivated land, watered by numerous winding streams and studded with villages and towns. The valley has the appearance of a lake bed, and Hindu records describe it as having been so at some former time.

The climate of Nepal, notwithstanding its low latitude, from its great and varying elevations above the level of the sea, is characterized by the widest extremes in different parts, and all degrees of temperature, from the cold of Siberia to the burning heat of the African desert, may be experienced in a day or two's journey. Generally, however, the climate resembles in some respects that of Southern Europe. The seasons are those of Upper India, but the rains commence earlier and set in from the south-east. In the *Tarai*, putrid fever is common and fatal from the middle of March to the middle of November.

The mineral productions of this country are varied and important. Copper and iron mines are worked in the hills, and lead, arsenic, and building stone abound. Mines of sulphur are said to be numerous, but little is known about them. The manufactures include utensils of copper, brass, and iron, the casting of bells and the fabrication of cutlery, ordnance, guns and swords, also coarse cotton-cloth and paper. Iron, copper, ivory, timber, hides, rice, ginger, wax, honey, earthenware, and fruits are exported.

The revenue is said to be about 1,000,000 rupees, and the population, about 3,000,000, consists of Gurkhas, Newars, Bhutias, and aboriginal mountain tribes. The Gurkhas are the ruling race and are Hinduized Tartars; the Newars, chiefly confined to Nepal Proper, are agricul-

lurists, traders, and artisans—they have Chinese features and are also of Tartar origin; the Bhutias inhabit the higher ranges adjoining Tibet. All classes drink spirituous liquors to excess, and most of the domestic servants are slaves. The language spoken by the Gurkhas is a mountain dialect of Hindi called *Prabatiya*; the dialect of the Newars is peculiar to themselves; Hindustani, however, is generally understood.

The chief towns are Katmandu, the capital, 4,784 feet in elevation and the head-quarters of the resident, having a population of about 50,000 souls, Lalita-Patan, Bhatgaon, Gurkha, Jamla and Makwanpur. This country is almost entirely unexplored, owing to the watchful vigilance and jealousy manifested by the ruling race in respect to intrusion from without. The British government practically has no influence over Nepal, and except the resident at Katmandu, no Englishman can enter, much more explore the country, and no survey can be executed, nor is the exact nature of the relations between Nepal and China correctly known, though it is said a mission with presents proceeds to China every five years.

#### NEPAUL. See NEPAL.

**NEPENTHA'CEÆ** is an order of plants inhabiting the damper and warmer parts of Asia, and having at the end of the leaves large hollow bodies, furnished with a lid, and containing water, secreted from a peculiar glandular apparatus with which they are lined. The only genus is *Nepenthes*, the **PITCHER-PLANTS** of India, China, and the Malay Archipelago. This order belongs to the **MONOCHLAMYDEÆ**, being placed by Benth and Hooker in the same series with *Cytinaceæ* and *Aristolochiaceæ*. With these it agrees in having a syncarpous ovary, with numerous ovules in each cell or placenta. The distinctive characters are that the flowers are dioecious, with a perianth of four parts: the stamens are monadelphous, the ovary is superior, and the albumen of the seeds fleshy.

**NEPENTHE**, a kind of magic potion, mentioned by Greek and Roman poets, which was supposed to make persons forget their sorrows and misfortunes.

**NEP'ETA**, a genus of plants belonging to the order **LAMIATÆ**. *Nepeta Cataria* (cat-mint) is native throughout the whole of Europe and middle Asia, and is plentiful in Britain. The whole plant has a strong smell, between mint and pennyroyal. Cats are said to be fond of it, and hence it derives its name; they roll themselves on it, and tear it to pieces apparently with much pleasure. *Nepeta Glechoma* is the **GROUND IVY**. Some of the species of *Nepeta* have pretty blossoms, and may be cultivated in the garden.

**NEPHELINE** (Gr. *nephelê*, a cloud) is a complex silicate of alumina, soda, and potash, crystallizing in hexagonal prisms. It is light coloured and has a vitreous or greasy lustre, with a specific gravity of about 2.5, and hardness of nearly 6. Nepheline is a rock-forming mineral allied to leucite and sodalite; it enters into the composition of several volcanic rocks, as *phonolite*, *nepheline-basalt*, &c., but it has also been found in some metamorphic rocks.

#### NEPHERITE. See JADE.

#### NEP'IDÆ. See WATER-SCORPION.

**NE'POS, CORNE'LIUS**, a native of Verona, was a friend of Cicero, who speaks of him in several of his letters. Nepos, however, was most intimate with Pomponius Atticus, whom he survived a few years, and whose life he wrote. His chief works, including a complete "History of Rome," and a "Life of Cicero" and other treasures, are lost. The well-known "Lives of Great Commanders," which is ascribed to him, is now generally believed to be rather a series of epitomes of the original work of Nepos, drawn up at the close of the fourth century by a certain Probus, otherwise unknown. The lives of Atticus and Cato the Censor, the sole remains of the book "*De Historicis Latinis*," are the only works of Nepos known to be genuine. This book,

that of the "Great Commanders," and fourteen others, on "Kings," on "Poets," on "Linguists" ("*De Grammaticis*") &c., each book taking one category, together made up the sixteen books of the "Illustrious Men," which earned for Nepos his great renown. All is quite lost save the fragments and the epitomes above mentioned.

**NEPTUNE**, the name given to the outermost planet of the solar system. We refer to **SOLAR SYSTEM** for the numerical details which relate to its orbit. We have here chiefly to describe the memorable circumstances of its discovery in 1846. The history commences in 1820, when the astronomer Bouvard of Paris prepared tables whereby the motions of the three great planets, Jupiter, Saturn, and Uranus, might be predicted. The movements of Jupiter and Saturn he found to agree well with the theory of gravitation, but there were discrepancies in the case of Uranus. Long before the discovery of Uranus as a planet, it had been frequently observed as a star, and its place had been measured by Flamsteed and other astronomers. These earlier observations could not be harmonized with the modern ones made since Herschel's discovery that Uranus was really a planet. Bouvard therefore discarded the older observations, and based his tables entirely on those recently made. A few years more, however, and Uranus began to deviate from the places indicated by Bouvard's tables, and in 1844 the error amounted to four minutes. This is perhaps a small quantity from a non-astronomical point of view. It is less than the seventh part of the apparent diameter of the moon, but with astronomical instruments it becomes very large and appreciable, and could not be overlooked even were it only one-tenth as great. In 1845 a young and then unknown French mathematician (Leverrier) commenced to investigate the movements of Uranus. He re-examined the whole of Bouvard's calculations, but only to confirm the existence of the great discrepancy. He then sought whether any orbit could be found for Uranus which would account for the observations when allowance was made for the perturbations produced by Jupiter and by Saturn, the action of other planets being inappreciable. No orbit fulfilling the conditions was found to exist. Some other source of disturbance must then be sought, and all analogy suggested that this must be due to the attraction of some other and unknown planet. It seemed plain that the orbit of this new planet could not lie between those of Saturn and Uranus, because then Saturn would have been disturbed as well as Uranus. The disturbing planet must therefore lie outside Uranus, and after profound labour Leverrier ascertained what the orbit must be, and that the planet's longitude would be 325° as seen from the earth at the beginning of 1847. Guided solely by his theoretical investigations, Leverrier wrote early in September, 1846, to Dr. Galle of Berlin, requesting him to search the heavens in the spot indicated. On a night ever memorable in the annals of astronomy (23rd September, 1846), Dr. Galle pointed his telescope according to Leverrier's direction and soon found an object which, by its movements and by its planetary disc, proclaimed that Leverrier had made a discovery hardly surpassed in the history of science. The orbit of the planet which disturbed Uranus had also been calculated independently by Mr. Adams of Cambridge, and from his results a telescopic search for the planet had been undertaken by Professor Challis. The plan adopted by Challis was that of trying to detect the planet's route among the stars, by determining the relative position of all the stars in the neighbourhood. It appeared subsequently that Challis had actually observed the planet on the 4th and 12th August, but the observations were not reduced, and so the fact that the planet was observed did not appear. Professor Newcomb has summed up the relative claims of Adams and Leverrier on this question when he writes:—"As between Leverrier and Adams the technical right of

priority in this wonderful investigation lay with Leverrier, although Adams had preceded him by nearly a year, for the double reason that the latter did not publish his results before the discovery of the planet, and that it was by the directions of Leverrier to Dr. Galle that the discovery was actually made. But this does not diminish the credit due to Mr. Adams for his boldness in attacking, and his skill in successfully solving, so noble a problem. The spirit of true science is advancing to a stage in which contests about priority are looked upon as below its dignity. Discoveries are made for the benefit of mankind, and if made independently by several persons, it is fitting that each should receive all the credit due to success in making it. We should consider Mr. Adams as entitled to the same unqualified admiration which is due to a sole discoverer, and whatever claims to priority he may have lost by the more fortunate Leverrier will be compensated by the sympathy which must ever be felt towards the talented young student in his failure to secure for his work that immediate publicity which was due to its interest and importance."

After some months of observation the orbit of Neptune was sufficiently known to enable its path to be traced in the heavens, and thus it became possible to see whether Neptune, like Uranus, had ever been observed as a fixed star before its planetary nature was known. Neptune being a small object there was not much reason for anticipating success; but when its place was traced back to the year 1795, it was found to coincide so closely with a star observed by Lalande on the 10th May, 1795, that a search for Lalande's star was made. It was not found; the place indicated by Lalande was vacant. That this was the planet was thus rendered highly probable, and the probability rose to certainty when Lalande's manuscripts were consulted. It was then found that he had observed this object both on the 8th and 10th of May, but that as there was a discrepancy between the two results he had discarded the former entirely, and put a query to the latter. The discrepancy we now see to have been due to the planet's motion in the interim. If Lalande had trusted to his own observations he would inevitably have discovered the planet and made his name immortal, but then such an accidental discovery would have deprived the world of that magnificent exhibition of mathematical skill, and that consummate proof of the law of gravitation which Adams and Leverrier have afforded. Science must ever rejoice that Lalande did not discover Neptune.

Neptune has a disc about 3" in diameter, of a pale-blue colour; no markings have been seen upon it. One satellite has been detected, its orbit being circular, with the following elements:—

Mean daily motion, . . . . .	61°25679"
Periodic time, . . . . .	5·87690
Distance (Log. $\Delta$ =1·47814), . . . . .	16·275"
Inclination of orbit, . . . . .	145° 7'
Longitude of node, 1850, . . . . .	184° 30'
Increase in 100 years, . . . . .	1° 24'

**NEPTUNE** (Lat. *Neptunus*), a Roman marine divinity, whose attributes are taken from the Greek Ποσειδών. The etymology of the name is doubtful. We may compare the form of the word *Nept-unnus* (Nept-umnus) with *Port-umnus*, *Vert-umnus*, and the word *al-umnus*; but the meaning or origin of the root *Nept* or *Nep* seems uncertain. The sculptors give a certain degree of roughness to the statues of Neptune. His hair was usually somewhat in disorder, and the whole of his figure was represented as exceedingly powerful and muscular.

**NEPTUNISTS**, in geology, a term applied to the followers of Werner, the celebrated mineralogist of Freiberg in Saxony. In the Wernerian system it was maintained that all rocks, whether stratified or unstratified, were formed by the action of water—that all were either

chemical or mechanical aqueous deposits. Hence the followers of Werner, in their controversy with the disciples of Dr. Hutton, who upheld as strenuously the igneous origin of all rocks (and were known as the *Vulcanists*), were generally known by the name of *Neptunists* (from Neptune, the mythical god of the sea). Later research, however, has distinctly shown that the doctrine of neither of the rival schools can be regarded as altogether correct; and there is no longer any doubt that both igneous and aqueous agencies have played an important part in arranging the materials of the earth's crust as at present observed. See **GEOLOGY**.

**NERBUD'DA**. See **NARBADA**.

**NEREIDÆ** is a family of marine polychate worms belonging to the suborder *ERRANTIA*. In this family the body is long and slender, the head has four eyes, two tentacles, and two large jointed palps. The protrusible pharynx is armed with two large jaws. *Nereis* is very common on the sea-coast, under rocks or in the sand. Some of the species of this genus are extremely beautiful, especially the Pearly *Nereis* (*Nereis margaritacea*), which has iridescent blue and pearly pink tints. The Large or White-rag Worm (*Nephtys caeca*), common on British coasts, also belongs to this family.

**NEREIDS**, nymphs of the sea (i.e. the Mediterranean, &c.), were the daughters of Nereus and Doris. The Nereids are said by most ancient writers to have been fifty in number. They were originally represented as beautiful nymphs; but they were afterwards described with the attributes of mermaids. The Nereids are to be distinguished from the Oceanids, nymphs of the greater ocean, beyond the pillars of Hercules. Thetis, the mother of Achilles, is usually held to be a Nereid.

**NEREUS**, a marine divinity of Greece (of the older or Titanic gods), son of Pontus, by the primeval earth goddess Gaia, and father of the fifty Nereids, by the Titan goddess Doris. He dwelt at the bottom of the *Ægean* Sea, of which he was the ruler, and his power of prophecy gave him the title of the "wise ancient of the sea."

**NERI, ST. FILIPPO DE'**, born in 1515 of a noble Florentine family, took holy orders in Rome, where he early distinguished himself by his works of charity. He was the founder of "Oratorios" or sacred musical entertainments, so called from his private oratory, where those performances took place. The design of Neri in these performances was to attract the worldly by interspersing suitable music among the week-day services which he held at Rome, and thus a school of sacred musical drama arose. He founded a congregation or order which took the name of "Fathers of the Oratory." This institution was approved by the Pope, Gregory XIII., in 1575, and soon spread over France, Italy, and other countries. Neri, after resigning the generalship of his congregation to his disciple Baronius—afterwards cardinal—died in 1595. Some of his letters, and his "Ricordi," or advice to youth, have been published. Neri was canonized by Gregory XV. in 1622. The Congregation of the Oratory of St. Philip, which Father Faber introduced into England in 1840, must not be confused with the French congregation of the same name, founded by the Cardinal de Berulle.

**NERO** (*Nero Claudius Cæsar Drusus Germanicus*), the sixth of the Roman emperors, was born at Antium in Latium, in the latter end of A.D. 37, nine months after the death of Tiberius. He was the son of Lucius Domitius Ahenobarbus and the younger Agrippina, the daughter of Germanicus Cæsar, and was originally named Lucius Domitius. After the death of Domitius and of a second husband, Crispus Passienus, Agrippina married her uncle the Emperor Claudius. The emperor gave his daughter Octavia in marriage to her son Lucius, and subsequently adopted him, when he took the names of Nero Claudius, &c.

On the death of Claudius, A.D. 54, Nero succeeded to

the sovereign power by the arts of his mother **AGRIPPINA**, who thought by this to obtain the chief management of affairs. Under the direction of Seneca, who had been Nero's master, and that of Burrhus, the first five years of his reign were distinguished by justice and clemency. His mother was enraged to find that her power over him became weaker every day, and his neglect of his wife Octavia, and his criminal love of Acté, a woman of low birth, widened the breach between them. The murder of **BURTANICUS**, the disinherited son of the late emperor, whom Agrippina threatened to set on the imperial throne in place of her son, forms the commencement of that long catalogue of crimes which disgraced Nero's reign.

Nero soon broke through all restraints, and his love for Poppæa, whom he had seduced from Otho, led him to

the murder of his mother. Poppæa perceived that she could not hope to become his wife while Agrippina was alive, and she prevailed on Nero to consent to his mother's death. Seneca did not hesitate to palliate or justify this abominable crime (Tacitus, "Annales," xiv. 11).

In the eighth year of his reign Nero lost his best counsellor, Burrhus, and Seneca withdrew from the palace, where his enormous wealth was calculated to



Coin of Nero.  
British Museum. Actual Size.  
Copper.

excite the envy even of the emperor. About the same time Nero divorced Octavia and married Poppæa, and soon after put to death Octavia on a false accusation of adultery and treason.

In the tenth year of Nero's reign, A.D. 64, Rome was almost destroyed by fire. Though Nero did all he could to assist those who had suffered from this calamity, he did not escape the suspicion of having himself set fire to the city, but the charge appears exceedingly improbable. He had the city rebuilt in a more handsome manner than before, and with wider streets, and himself constructed the enormous "Golden House" (never finished), the largest palace in the world. The Christians were currently believed to be the authors of the fire, and numbers of them were seized and put to death with cruel tortures. Many were bound to poles with tarred bands, and thus set alight in the gardens of the Vatican hill, and it is said Nero looked on at this horror.

In the following year, A.D. 65, a conspiracy was formed for the purpose of placing Piso upon the throne, but it was discovered, and the principal conspirators were put to death. Among others who suffered on this occasion were Lucan and Seneca. In the same year Poppæa died of a kick which she received from her brutal husband. Nero appears to have lost his reason, if history is to be believed, and to have become little better than a raging madman. The same result is very frequently observed to follow the possession of absolute power. Henceforward every month saw some noble or distinguished man banished or killed; and the public hate grew strong against the monster.

During the latter part of his reign Nero enthusiastically engaged in theatrical performances, and in contending for the prizes at the public games. He visited the chief cities of Greece, and received no less than 1800 crowns for his victories in the public games there. Soon after his return to Italy, Vindex, who commanded the legions in Gaul, declared against his authority, now everywhere execrated; and his example was followed by Galba, who commanded in Spain. The prætorian cohorts at Rome espoused the cause of Galba (A.D. 68). Nero at once fled

for his life, but being overtaken by his pursuers as he lay concealed in the cellar of a house of one of his freedmen he stabbed himself, and expired almost as soon as they arrived. During his reign the empire enjoyed in general a profound state of peace. In the east the Parthians were defeated by Corbulo; and in the west the Britons, who had risen in arms under Boadicea, were again reduced to subjection by Suetonius Paulinus. See **BOADICEA**.

**NERVA, MARCUS COCCETUS**, the thirteenth Roman emperor, was born at Narnia, in Umbria, in A.D. 32. (His grandfather, consul in 22, was a great favourite with Tiberius, and one of the most celebrated jurists of his age.) Nerva was employed in offices of trust and honour during the reigns of Vespasian and Titus, but he incurred the suspicion of Domitian, and was banished by him to Tarentum.

On the assassination of Domitian on the 18th of September, A.D. 96, Nerva was proclaimed by the soldiers and people, and quietly succeeded to the sovereign power. His mild and equitable administration formed a contrast with the sanguinary rule of his predecessor. But the prætorian cohorts, who had been indulged by Domitian, were hostile to him, and in order to strengthen himself he adopted a man of ability and courage, Trajan, as his successor, and associated him in the government. Nerva died in the beginning of A.D. 98, after a reign of sixteen months and nine days.

**NERVIL**, a powerful, brave, and warlike Belgic Gaulish tribe, whose territory extended from the Sambre to the ocean, including the forests of the Ardennes. In their great battle with Julius Caesar, B.C. 58, they fought so fiercely that only 500 were left alive out of 60,000 men bearing arms.

**NERVOUS SYSTEM** consists of (1) nervous matter or *ganglia*, such as the brain and spinal cord; (2) special apparatuses in the organs of sense, in muscle, and in glands, called *terminal organs*; and (3) *nerves* or cords connecting the ganglia and the terminal organs. The general functions of the ganglia have been already described under **BRAIN**.

1. *Nerves*.—These are white cords found ramifying in almost every tissue and organ of the body. When a bit of nerve connected with the brain or spinal cord is examined microscopically it is found to consist of minute fibres varying in diameter from the  $\frac{1}{1000}$  to the  $\frac{1}{100}$  of an inch (see fig. 2 in Plate). Each nerve-fibre consists of three parts—(1) an external sheath; (2) within this the medullary sheath or white substance; and (3) in the centre a delicate fibre (see description on Plate). In the nerves of the sympathetic system the fibres have no white substance or external sheath. If the central portion of a nerve-fibre be traced to the brain or spinal cord, or indeed to any nerve-centre, it is found to end in the process or pole of a nerve-cell, while in the outer parts of the body it is found to end in muscle, bloodvessel, gland, skin, or sense organ. The fibres in a nerve are bound together by delicate tissue, and the structure may not be inaptly compared to that of a telegraphic cable containing numerous wires.

2. *Nerve-cells*.—The other essential constituent of the nervous system is various minute bodies called nerve-cells. They may be spherical, ovoidal, or irregularly triangular (see fig. 3 on Plate), and they are bound together by connective tissue, bloodvessels, and nerve-fibres, so as to form the *gray matter* seen on cutting into the brain or spinal cord. The *white matter* of these great centres consists of delicate nerve fibres.

3. *The special property* of a nerve-fibre or of a nerve is, that it may be irritated or excited, and when this occurs some kind of change is transmitted along the nerve. The nerve is said to be *irritable* or *excitable*, and the change sent along it is called the *nerve-force*. This nerve-force travels along the fibres with a velocity of about 90 feet per

second in cold-blooded animals, such as the frog, and about 200 feet per second in man and other warm-blooded creatures. A nerve may be irritated in many ways, such as by touch or pressure, by electricity, or by the chemical action on it of many substances, as, for example, common salt; but in whatever way it may be irritated, some change is sent along it to its termination, and what then occurs depends on the apparatus or structure at the end of the nerve. Thus, if the nerve end in a muscle the result will be contraction of the muscle; if in a gland, secretion; if in a bloodvessel, change in the calibre of the vessel; if in the brain, consciousness or feeling of some kind, such as heat or pain, or touch, or taste, or smell, or light, or sound; and if, as in a few fishes, in an electric organ, there will be an electric discharge. Nerves that convey impressions inwards to the centres are called *sensory* nerves, whilst those that carry impressions outwards are called *motor*, if they go to muscles; *secretory*, if they go to glands; and *vaso-motor*, if they end in bloodvessels.

4. The *terminal organs* are structures in the senses adapted to receive special kinds of stimuli. Such are the *retina* or nervous tunic in the eyeball, connected by the optic nerve with the brain, and specially susceptible to vibrations of light; the arrangements for the reception of sound waves in the ear, for sapid substances in the tongue, for odorous matters in the nose, and for contact or touch in the skin. It matters not how these terminal arrangements, or the nerves connected with them, be stimulated, the result is always the same. Thus, whether the optic nerve be stimulated by the action of light on the retina of the eye, or by pricking, cutting, pinching, or irritated by electricity, the result is not pain, but a sensation of light or of colour, the reason being that when the message carried by that particular nerve reaches the brain, it always arouses the appropriate mode of consciousness, that of light. The same law holds good of all terminal organs and of the nerves connected with them. There are also terminal arrangements where the nerves end in muscles, or in glands, or in vessels, or in electrical organs, and they are specially fitted for setting these various mechanisms in action. Thus we may consider nerves as *conductors*; they probably all conduct the same kind of change, and the result depends on the mechanism in which they end. In a similar way copper-wire might be caused to conduct a current of electricity, which might drive a machine, or work a telephone, or perform electro-plating, or render an electric lamp luminous.

5. *Reflex Actions*.—Impressions made on sensory nerves are conveyed to nerve-centres, and these may or may not awaken consciousness. If when we touch the foot of a sleeping person the leg is drawn away, we have a kind of motion called a *reflex act*. The person does not feel the touch, because he is supposed to be in the unconsciousness of deep sleep; he therefore cannot, by an act of will, have moved the limb, and yet the limb was moved. This is explained by supposing that the nervous influence passed from the point tickled or touched, say the sole of the foot, up the nerves of the leg to the spinal marrow, and there set up changes in the nerve-cells of the gray matter in the centre of that organ, which resulted in another influence being sent outwards along motor nerves to muscles, causing these to contract. Such reflex mechanisms play an important part in the physiology of the nervous system. The following are some of the more common examples:—Motions of the muscles in any part of the trunks or limbs under the influence of sensory impressions on the skin, such as tickling, pricking, &c.; shuddering from cold, shuddering caused by grating noises, &c.; contraction of the pupil of the eye under the influence of light on the retina; winking from irritation of the nerves of the conjunctiva, the mucous covering of the eyeball; sneezing, from irritation of the nose; spasm of the glottis, or cough-

ing from irritation of the larynx or trachea; laughing caused by tickling of the skin; the first inspiration of the child at birth from the impression of cold on the nerves of the skin; the respiratory movements of the adult, as when a sudden blast of cold air causes a deep inspiration; sucking in infancy; all the complicated movements of swallowing; vomiting caused by irritation in the stomach, or on tickling the fauces or throat with a feather; rhythmic movements of the heart and other organs; the action of the sphincter muscles that guard the alimentary and other canals; the expulsive efforts of the uterus in parturition; and many morbid actions, such as cramps caused by irritations in the alimentary canal; the convulsions of childhood, induced by irritation in the gums; dilatation of the pupil and the grinding of the teeth from the irritation of worms. Certain poisons and morbid changes, by increasing the excitability of the gray matter of the cord, cause exaggerated reflex movements. Such are the convulsive attacks caused by strychnia, the poison of hydrophobia, and tetanus or lockjaw, where the slightest irritation of the skin, such as a movement of the bed-clothes, or of a sense organ, as of the ear by the slamming of a door, may cause a violent attack of convulsive spasms.

6. *Inhibitory or Restraining Actions*.—It has been discovered that certain nerves, when stimulated, do not cause muscular contraction, but, on the contrary, arrest it. This is well exemplified in the case of the heart. This organ, especially in the case of a cold-blooded animal, may beat for hours after removal from the body. The rhythmic beat depends to some extent on the existence in the heart of ganglia or small nerve-centres. Now the heart receives nerves from two sources, from the vagus nerve (a great nerve springing from the medulla, and distributed chiefly to the throat, gullet, stomach, and lungs), and from fibres derived from the spinal cord through the sympathetic. If the vagus be cut and the lower end irritated, the heart beats more slowly and will likely be brought to a standstill in a dilated condition. On stopping the irritation the heart will soon resume its beats. Had the vagus been a motor nerve of the heart, its stimulation would have caused tetanus or cramp, as happens to a muscle when its nerve is irritated, and the heart would have been arrested in a state of tetanus or cramp. But the opposite is the fact; it is stopped in a state of relaxation. Hence, reasoning on this experiment, and taking into account the action of various poisons, it is held that the influence of the vagus is to modify the activity of the heart, moderating the strength and frequency of its beats. It has further been ascertained that fibres of the sympathetic nerve which pass to the heart have an opposite influence. Thus their stimulation causes the heart to beat faster instead of slower, and such nerves have been called *accelerating*, as opposed to *inhibitory or restraining*. This example illustrates how the nervous system governs or regulates the activity of various organs.

7. *Effect of Nerves on Vessels*.—The bloodvessels are not to be regarded as tubes of unvarying calibre, like the pipes conveying water through a city. Their walls are elastic, and they are also contractile from the presence of muscular fibres passing spirally round them. By variations in the amount of contraction of these fibres the calibre of the vessels may be modified, and thus the amount of blood flowing through them in a given time will be regulated. Such muscular arrangements are under the control of nerves, called *vaso-motor*, because they are concerned in the movements of vessels. Vaso-motor nerve-fibres exist chiefly in the sympathetic nerve, but this nerve derives them from the cerebro-spinal system. If the sympathetic nerve be cut in the neck, there is a dilatation of the vessels and an increase of temperature on the same side; but weak irritation of the end of the cut nerve next the brain will cause the vessels to contract and the temperature to fall. These

• fibres of the sympathetic which thus govern vessels, originate chiefly in a centre of gray matter in the medulla oblongata. [See BRAIN.] From this chief vaso-motor centre nervous influences stream out, which keep the smaller vessels in a more or less contracted condition. If it be injured, paralyzed, or destroyed, there is at once great dilatation of the vessels, more especially those of the abdominal organs, and the blood collects in these dilated vessels. It would also appear that this central vaso-motor centre may be controlled by influences coming to it from the heart, and from sensory surfaces such as the skin, and thus, by the nervous arrangements, the calibre of the vessels is regulated so as to be adjusted to the activity of the heart or force-pump, and to the necessity of sending, at any given time, more or less blood to an organ. The nerves, stimulation of which is followed by contraction of vessels, are called *vaso-constrictors*, to distinguish them from certain nerve-fibres that appear to inhibit or restrain the contraction of vessels, hence called *vaso-dilators*, or *vaso-inhibitors*. For example, in certain nerves distributed to glands there are fibres stimulation of which causes the vessels to become dilated.

8. *Influence of Nerves on Glands.*—Secretion is the separation of some material from the blood that may be either voided as useless or injurious, such as the urine, or may be used for changing the food, like the saliva and gastric juice. The organs engaged in secretion are called glands, of which there are various kinds. The activity of these glands is regulated by the nervous system in two ways:—(1) By affecting the distribution of blood to the gland through the vaso-motor nerves, already described; and (2) by nerves passing directly to the secreting cells of the gland. For example, if a little mustard or other sapid substance be placed on the tongue, the nerves of the surface of the tongue are irritated, an influence is carried to a small local centre or ganglion, and from it is reflected or sent out along nerves to the vessels and cells of the gland, and secretion is at once excited.

9. *Influence of Nerves on Muscles.*—If a nerve passing to a muscle be stimulated the muscle contracts. The nerve in this case does not supply energy or force to the muscle, but it simply liberates the energy previously stored up in the muscle. Thus a nerve acting on a muscle is a liberating mechanism, and many physiologists consider that this is a type of all kinds of nervous action.

10. *Chemical Constitution of Nervous Matter.*—This is imperfectly known, and gives little or no information as to its functions. Gray matter is distinguished chemically from the white by containing more water, albumen, lecithin, and lactic acid, and less cholesterin, fat, and protogen. The salts are similar to those in the blood; about 40 per cent. of these consist of phosphates of soda and potash; but the phosphorus of the brain, on which its activity largely depends, exists in highly complex, albuminous, and fatty bodies. The large amount of water, amounting to no less than from 70 to 80 per cent., shows that the substance of the nervous system is in a condition suitable for rapid molecular changes, on which its functions probably depend. The following table gives the results of one of the most recent analyses of the central nervous organs:—

	Gray Matter.	White Matter.
Water, . . . . .	81·6	68·4
Solids, . . . . .	18·4	31·6
The solids consist of:—		
Albumens and gelatin, . . .	55·4	27·7
Lecithin, a body containing		
phosphorus, . . . . .	17·2	9·9
Cholesterin and fats, . . .	18·7	51·9
Cerebrin, . . . . .	0·5	9·5
Substance soluble in ether, .	6·7	8·8
Salts, . . . . .	1·5	0·6

Having thus described the general structure and modes of nervous activity, it remains to indicate shortly the functions of the portions of the nervous system not treated under the heading BRAIN. There are two systems, the *cerebro-spinal* and the *ganglionic*, or great sympathetic system. The nerves of the first system are immediately connected with the brain and spinal cord, and include all those which are the media of sensation and voluntary motion; the second system contains those nerves which are connected with the brain and spinal cord, or the nerves proceeding from them, only by very small filaments, which bear numerous ganglia in all parts of their course, and which are subservient to the actions of those parts which are engaged in the nutritive functions, and upon which the mind has in general no direct influence.

These two systems of nerves are developed together from almost the lowest animals. Nervous filaments have recently been seen in the body of the polyp-bearing animals, and even in sponges. Many of these simple animals are sensible to light and other impressions, and their motions indicate the agency of the same means as those which act in the higher animals. They have also been found in jelly-fishes and sea-anemones. In those of the Radiata (such as starfishes, &c.) in which nerves are traceable, their distribution is that of a circular ring round the mouth, with branches into the arms.

In the Articulata the nervous system assumes the form of a double cord having numerous ganglia on it. In the Mollusca the nervous œsophageal ring is present as in the last class, and is often provided with numerous distinct ganglia, whose size bears a direct proportion to the organs of sensation placed near the mouth, and to the activity and complexity of the masticatory apparatus. The columns continued along the abdominal portion of the animal are usually, like itself, short; and except when active motions are performed by a foot or other locomotive organ, they bear but few and very small ganglia.

The nervous system of the Mollusca is thus chiefly concentrated about the head, and its development is proportioned to that of the organs of sense and motion which are subservient to nutrition, while the nerves of the body are but little developed. In the Articulata, on the other hand, in accordance with the greater proportionate development of their locomotive powers, the part of the nervous system belonging to the trunk becomes predominant. In the Vertebrata, which possess both nutritive and locomotive powers more highly developed than either of the preceding classes, the types of both are united; the cerebral mass being a more highly developed form of the large supra-œsophageal ganglion of the higher Mollusca, while the spinal cord, with the ganglia on its sensitive roots, corresponds with the long ganglionic cords of the Articulata.

The most essential part of the nervous system of the Vertebrata is the spinal cord, with its continuation in the cranium as far as the crura cerebri and cerebelli, and the ganglia formed upon them, which together constitute that which is termed the cerebro-spinal axis. This axis is always inclosed in an osseous sheath placed in the posterior part of the body, and it is never, as in the Invertebrata, traversed by the alimentary canal.

The sympathetic system of nerves distributed to the viscera, which in its simplest form, in the Annelida, is composed of a few filaments from the supra-œsophageal ganglion, which pass along the dorsal artery, preserves in all classes the same separation from the sensitive and motor cords, and the same general distribution about the viscera. It increases in complexity in the same degree as the cerebro-spinal system, and acquires in the Vertebrata an extensive and still increasing development. It forms in the highest of them numerous and complicated plexuses, with many and some large ganglia, which follow the course of the principal bloodvessels, and are distributed to all the

organs of organic life; it still communicates but little with the cerebro-spinal axis, sending only small filaments, which mingle with the spinal and some of the cerebral nerves near their roots. The most important part of the nervous system of the Vertebrata, and which is subject to most alteration, is the brain.

The *spinal cord*, in which all the nerves of the trunk have their apparent origin, is composed of two lateral halves, symmetrical in form and size, and united together by a part of their inner surfaces at the median line. The outer portion of the cord is composed of white nervous matter, the inner of gray, an arrangement the reverse of that of the brain, in which the cortical substance is gray and the medullary or central white. Each lateral half of the spinal cord is again obscurely divided by superficial furrows into an anterior and a posterior column, and a smaller middle portion between them. All the nerves by which sensitive impressions pass arise from the groove between the posterior column and middle column; and all those, with the exception of the spinal accessory nerve, by which the excitants to muscular motions are conveyed, arise from the groove between the anterior or middle columns. They all arise by what are called roots, that is, by a number of fine nervous threads or narrow bands attached to the grooves and passing for a short distance into the substance of the cord, which, as they proceed outwards, converge and unite into a single cord or nerve. There is an important distinction, however, between them; the roots of the posterior or sensitive nerves have a ganglion at their union just where they are leaving the vertebral canal, while those of the anterior or motor nerves unite without any ganglion into a single cord, which passes over, but does not communicate with the ganglion on the posterior roots. Beyond this ganglion the anterior and posterior roots unite in a common sheath, in which their filaments, though they continue distinct, are indiscriminately mixed; and in this manner they proceed through the varied branchings of the sheath to nearly all parts of the body, conveying the power of perceiving impressions to all, and the power of motion to the muscles and probably a few other tissues.

The conveyance of those impressions which produce sensation is the property exclusively of those nervous filaments which arise from the posterior columns of the spinal cord and their continuations in the brain. If the posterior roots of a nerve be divided, all the parts supplied by that nerve lose their sensibility; or if a nerve be divided in any part of its course, then all the parts supplied by branches given off between the point of division and the brain retain their sensibility, while those which are supplied by branches given off in the other part of the nerve more distant from the brain are rendered insensible.

The system of the *great sympathetic nerve* is that whose branches are distributed to all the organs of organic life, the heart, lungs, digestive canal and glands, &c., chiefly following the course of the bloodvessels, bearing numerous and large ganglia in all parts of their course, and communicating with the brain and spinal cord or their nerves only by few and small filaments. The parts to which the branches of the sympathetic nerve are distributed have but vague if any sensibility, unless under peculiar circumstances of disease; and the motions which some of them possess are usually quite independent of the mind. Thus the peristaltic motion of the intestines, the contractions and dilatations of the heart of some animals, and some other similar actions, will continue for a considerable time after they are separated from the body, or after all the nerves passing to them have been divided. Many other facts prove also that the internal organs are much less dependent on the influence of the sympathetic nerve than the external animal organs are on that of their cerebro-spinal nerves; severe irritation of the sympathetic nerves, such as, if applied to the cerebro-spinal motor nerves, would excite

sudden and violent convulsions of their muscles, gives rise to but weak and slow contractions of the viscera; and these follow at perceptible intervals after the application of the stimulus, so that it is often difficult to say whether the irritation has exerted any influence at all. As shown above, one of the most important functions of the sympathetic system of nerves is the regulation of the calibre of the bloodvessels.

In the Plate prefixed to this volume the nervous system will be found developed in fig. 1, the principal nerves only being particularized. See also BRAIN.

**NES'SOS**, the Centaur, is famous in the Greek mythology for causing the death of Héraklēs. Having attempted to run off with Dejanaira, the wife of Héraklēs, when he was carrying her across a stream, he was killed for his misconduct by the poisoned arrows of the hero. Steeping his tunic in the blood he gave it to the princess as he died, alleging that it would bring back the love of her husband if it should wander from her. When the unhappy woman tried this remedy some time afterwards Nessos took his posthumous revenge; for the poisoned robe clung to the hero and ate into his flesh until, to end his agony, he burnt himself upon a funeral pile.

**NESTOR**, one of the heroes of the Trojan War, was King of Pylus, and son of Nélus. As a young man he was a great warrior, and helped Theseus with the Lapithai against the Centaurs, took part in the hunt of the boar of Kaludón and in the Argonautic expedition. He was very old when he took part in the siege of Troy, and had already ruled three generations of men; his experience and wisdom were therefore deemed of incalculable service. He was one of the few princes who returned safely to Greece.

**NESTOR** is a genus of parrots (*Psittaci*) usually classed with the Lories, but probably to be regarded as forming a distinct family. There are two species, both belonging to New Zealand—a third (*Nestor productus*), a native of the adjacent Philip Island, being now extinct. The Kaka (*Nestor meridionalis*) is about the size of a crow, with a large, powerful beak. The plumage is olive brown, the crown gray, the ear-coverts shaded with orange, and the under surface dark red. The kaka takes the place of the woodpecker among the New Zealand fauna, feeding chiefly on insects and their larvæ, in the search for which it strips the bark from the infested trees. It also feeds on fruits and the nectar of flowers. It is social and semi-nocturnal in its habits, remaining concealed during the day, and coming forth in noisy troops in the evening. The KEA (*Nestor notabilis*) is remarkable for having developed quite recently a taste for sheep's flesh.

**NESTORIUS** and **NESTORIAN**. Nestorius, patriarch of Constantinople from 428 to 431, was a native of Germanicia in Syria, and a disciple of the learned Theodore of Mopsuestia. In 427 Theodosius II. appointed him to the vacant patriarchate of Constantinople, thus passing over the local clergy who aspired to this distinction. In consequence, when he assumed office, he found many among the monks who regarded him with feelings of hostility. He became involved in a dispute in reference to the title "Mother of God," then commonly applied to the Virgin Mary, but which Nestorius condemned as savouring of heresy. The controversy soon extended beyond the limits of his patriarchate, and he found a determined and uncompromising opponent in the famous CYRIL of Alexandria. Nestorius was at first supported by the emperor, but Cyril gained over Celestine, bishop of Rome, and the bishops of Ephesus and Jerusalem to his side, and had the address to separate Pulcheria, the sister of the emperor, from the court party, which supported Nestorius. In 431 the emperor was induced to call a general council at Ephesus to decide upon the questions that had arisen. This was the third œcumenical council. The leading opponents on both sides appeared at the council supported by bodies of



\*armed men, and the proceedings were of a very tumultuous and disorderly character, but in the end, after a series of excommunications and counter-excommunications and the depositions of Cyril, Nestorius, and Memnon, the bishop of Ephesus, from their sees, the emperor was induced to restore the first and last of these, but was compelled to resign Nestorius to the power of his enemies. He withdrew at first to the shelter of his old monastery at Antioch, but in 435 he was banished to Petra in Arabia. From thence he was moved to a city in Upper Egypt, and during the closing years of his life he was hurried from place to place, suffering much ill usage at the hands of the creatures of his triumphant rival Cyril, but the time, place, and circumstances of his death are unknown.

His followers found protection in Persia, from which empire they spread into Arabia and India, and even reached as far as China. The seat of their patriarch was for a long time at Seleucia-Ctesiphon, afterwards in Bagdad, and then in Alkôsh. The chief distinctive doctrine of this sect seems to have been that in Christ there were two distinct persons—the human person of Jesus and the divine person of the Word—but so far as Nestorius himself is concerned, it would seem that he never formulated any such doctrine. In the thirteenth century the Nestorian patriarch is said to have had twenty-five metropolitans under him, but the sect was almost extirpated by Timur. The remnants, however, retained their faith, and at the present day they are represented by about 70,000 persons, settled in the wild and inaccessible regions of Eastern Kurdistan, and on Persian soil to the west of the Lake of Urmia. The patriarch, who is styled "Lord Simeon," resides at Kotehanneh, near Julamerq, and possesses great influence over them. Many of them have been brought under the influence of the Roman Catholic Church, and the American missionaries have since 1831 done much for their education and improvement. They are disliked by the Turkish government, and the savage Kurds frequently attack those who inhabit the lowlands. The mountaineer Nestorians are a more warlike race, and are better able to defend themselves.

**NESTS.** This word is generally used to indicate the structures formed by birds at the breeding season for receiving their eggs. It is often used in a larger sense to include the breeding places of all animals. It is, however, very doubtful if much is gained by giving such a broad and necessarily indefinite meaning to the term, which is sure to continue to be popularly associated with the habits of birds chiefly.

Among insects, nests, in the strict sense of places in which the eggs are deposited and hatched, are not uncommon. The elaborate nests of ants, bees, and wasps are well known. In some fishes, especially the sticklebacks (*Gasterosteus*), the male constructs a nest and watches over the eggs deposited in it by the female.

The building of a nest is almost universal among birds. Yet even here there are many who, for various reasons, neglect to provide a shelter for their eggs. The oystercatcher deposits its three or four dirty-coloured eggs on the shingly beach or on rock, without any provision of a nest. In direct contrast to this, the eider-duck prepares a coarse bed of lime-grass, dry seaweed, &c., as a mattress, on which she spreads a blanket of soft down plucked from her breast. The puffin either forms a burrow for itself or takes forcible possession of a rabbit burrow, and in it drops a rounded oval white egg. The water-hen builds its coarse nest of flags and rush s on the osier branches close by the water, and in this places seven or eight yellowish-brown eggs. Indeed almost every genus of aquatic birds differs in the mode of nest-building. Among game birds the same variety does not occur. Most of them, as the partridge, the pheasant, the red grouse, are satisfied with the soft grass or moss in the spots chosen for nesting. The mound birds

of Australia construct a mound of sand or decaying vegetable matter, and leave their eggs therein to hatch. The pigeons construct very rude nests. The rock-dove chooses a hole in the rock, or in old walls, and carries thither a few bits of withered twigs, straws, and the like, and with these forms a rude floor for the eggs. The wood-pigeon builds a nest on trees with withered twigs, which in many cases are laid so loosely together that when looked at from below the eggs may be seen inside. The woodpeckers excavate a hole in decayed parts of trees, and in this the eggs are deposited without any lining. But it is among the passerine birds that the greatest variety obtains. Here you have the coarse and unsymmetrical twig-built nest of the rook, on the one hand; the delicately formed nest of the chaffinch, the gold-crest, or the common wren, on the other. Between these, nests of varied forms, situations, and material occur in great abundance and variety. Some build on the ground, as the skylark; some love low-growing evergreens, as the blackbird; some place their nests halfway up a tree, as the chaffinch; others like the tree tops for safety, as the missel-thrush. In most cases the nest is open, but in others it is roofed and entered by a round hole. The nests of the birds of prey are generally coarsely and rudely built, whether placed on trees or on the ledges of rocks. Of foreign birds may be mentioned the tailor-bird, which sews together the edges of two leaves to form its nest; the edible swifts, whose nest is made of inspissated saliva; the baya bird of India, with its beautiful pensile nest; the weaver-bird and oven-bird construct remarkable nests; and there are many others whose nests fill us with astonishment, whether we contemplate their beauty, the skill which constructed them out of such rude materials, or their complete adaptation to the habits of the architect.

Mr. Wallace propounds an ingenious theory of birds' nests in his "Contributions to the Theory of Natural Selection." He lays down the general law, which observation confirms, that when both sexes are of conspicuous colours, the nest is of such a nature as to conceal the sitting bird; while whenever one sex, usually the female, is markedly contrasted with the other by its dull and sombre plumage, the nest is open, and the sitting bird is exposed to view. Mr. Wallace also considers that birds build rather from imitation than by instinct.

**NESTS, EDIBLE.** These nests are built by species of the esculent swallows (*Collocalia*) and eaten by the Chinese. The esculent swallows belong to the family Cypselidæ, so that they would be more properly called swifts. The nests when first made are composed entirely of inspissated saliva secreted from the salivary glands, which are very large in these birds. There are several species of *Collocalia*, native of India and the Malayan region, the best known being *Collocalia nidifica*. In their habits they resemble other swifts. They breed in caverns, gluing the nests on to the sides of the rocks. The collection of the nests is undertaken in Java at three periods in the year. The nests first gathered are very small, shallow, and somewhat triangular in shape, and contain two pure white eggs. In the nests made after these are removed, feathers, grasses, and other substances are mixed with the saliva. The best and purest nests are very highly prized, and fetch enormous prices. The nests are dissolved in water, and taken as soup, which is highly spiced with minor substances. The Chinese set high value upon it as a stimulant; but for this opinion there seems to be no ground, as the most recent analysis shows that the material does not consist of any specially nourishing or stimulating substances.

**NETHERLANDISH SCHOOL OF MUSIC.** During the great prosperity in the cities of the Netherlands in the fourteenth century there came many arts to the forefront, and of all these that which made the most wonderful progress was the art of music. So rapidly did the



school advance in excellence, that when the popes returned to Rome from their long "Babylonish captivity" in France, or rather in their own city of Avignon, which lay in France, they imported some of the best men of the new school to start afresh the papal chapel choirs at Rome; and from these men arose our modern music. The leader of this band was Willem Dufay, born at Chimay, in Hainault, in 1350; and who was singing at Rome probably in 1377 when the Pope returned there, certainly in 1380. He died in 1432. Masses by Dufay, containing specimens of "imitation" and the beginnings of counterpoint, are still extant, and can be sung with some pleasure. He was succeeded somewhat later as the head of the school, but in France instead of at Rome, by Ockenheim or Ockeghem, who was the choirmaster of Louis XI. of France, and who carried the art of imitation onward into canon or perpetual imitation, writing long pieces in that form, which are wonderfully clever, though they certainly are not beautiful. All his music is, however, not quite so learned nor so dull. His pupil was the famous Josquin (*i.e.* Little Josse or Joseph) des Prés, whom the Italians called Giusquino del Prato. Josquin was a great genius. His "Ma petite Camusette" is a charming part-song foreshadowing the madrigal. His long life (1440-1521) was also a very industrious one; his reputation became European, and after dragging the mass music of Rome out of the mere scholastic routine of the earlier learned masters, he served successively the great Duke of Ferrara, Louis XII. of France, and the Emperor Maximilian; and his music was well beloved by our own Henry VIII., to whom Anne Boleyn introduced it. The printing press, established by Petrucci at Venice in 1501, has preserved for us a large stock of Josquin's music. His pupils are also well known to us, and form a truly splendid list. The chief of them are Jakob Arcadelt, Jean Monton, Adrian Willaert, Claude Goudimel, Gombert, and Clemens non-Papa, so called in fun to distinguish him from the contemporary Clement who was a pope (Clement VII.) Of these Arcadelt was singing master of the boys at St. Peter's in 1539, and wrote many fine masses (three books were published in 1557), but to us his madrigals, which long retained a great popularity, are still more enjoyable. He took service with the great Cardinal of Lorraine (Guise) in 1555, and so finished his days in France. Monton (1475-1522) was the chief musician of Francis I. of France, and followed Josquin in the canonry of St. Quentin. Willaert (1490-1563), pupil of Josquin and of Monton, is the first composer to use the word "madrigal," and he in the course of his wanderings reached Venice, settled there, and became the founder of the Venetian School. His pupil and successor was Cyprian Van Roor, whom the Venetians Italianized into De Rore, and whom they so loved as to style him "Il divino." He followed his master in the madrigalian style. Nicolas Gombert was the chief musician of Charles V. (although his master and fellow-pupils were patronized by the great French rival kings, for music knows no politics), and was one of the first to aim at reflecting the character of the words by varying the music. His fellow-pupil, Jacques Clement (Clemens non-Papa), succeeded him under Charles V. Hitherto the whole music of Europe has been in the hands of Netherlanders; the courts of Henry VIII., Francis I., Charles V., and the chapels of the popes, all own their sway. But when Goudimel (1510-72), who became a Protestant, set up an open school in Rome itself, the Italians came to learn music; and one of his pupils, the wonderful and glorious Palestrina, at last wrested the sceptre of music from northern hands and transferred it to Italy. Goudimel perished in the Huguenot massacres at Lyons on the fatal St. Bartholomew.

One more, and that the greatest, Netherlandish composer remains to be noticed. This is the contemporary and rival of Palestrina—the great Roland de Lattre

(1530-94), whose name is Italianized as Orlando di Lasso. He excelled in every form of composition. A madrigal of his ("Matona Mia"), republished in London in 1885, in the *Musical Times*, astonished every one by its tunefulness, its sweetness, and its jollity. The singers are serenading some one, and they catch cold and sneeze as the night grows. The poet supplies them with such words as *cazzar, cазze, becazze*, &c., and the musician turns these to the best advantage. Every division ends with "don, don, don, diri, diri, don," in the merriest way. This gaiety is indeed typical of De Lattre. Every one loved him and petted him. While quite young he went from Flanders to Rome, and soon rose to the highest posts there. He visited England in 1553, and was friendly with Cardinal Pole. Afterwards he lived in Flanders some time, and then served the Duke of Bavaria. Both the emperor and the Pope conferred on him orders of nobility. The Elector of Saxony sought to tempt him; the King of France (Charles IX.) found refuge only in his music from the pangs of conscience after the crime of the St. Bartholomew massacre, and De Lattre was actually on his way to console the poor king (as Farinelli did the kings of Spain, later on) when Charles died. Anyone who has heard his madrigals, masses, or motets, must admit he deserved this world-wide fame. With him, in a final burst of splendour, passed away the Netherlandish supremacy over music.

**NETHERLANDS, KINGDOM OF THE, or HOLLAND**, consists of the territory of the ancient republic of the Seven United Provinces. It is bounded on the east by Hanover and Prussia, on the north and west by the German Ocean or North Sea, and on the south by Belgium. Its length is 196 miles, and its greatest breadth 109 miles.

*Area and Population.*—The kingdom consists of eleven provinces, and has the Germanic duchy of Luxemburg, held by the sovereign as grand-duke, associated with it, which gives him a vote in the councils of the Germanic Confederation:—

Provinces.	Principal Towns.
North Holland, . .	Amsterdam, Haarlem, Alkmaar, Saardam.
South Holland, . .	The Hague, Rotterdam, Leyden, Dort, Delft.
Zeeland, . . . .	Middelburg, Flushing.
North Brabant, . .	Bois-le-Duc, Breda, Bergen-op-Zoom.
Utrecht, . . . .	Utrecht, Amersfort.
Guelderland, . .	Arnheim, Nimeguen, Zutphen.
Overijssel, . . .	Zwolle, Deventer, Kampen.
Drenthe, . . . .	Assel, Meppen.
Friesland, . . .	Leeuwarden, Harlingen.
Groningen, . . .	Groningen, Delfzyl.
Limburg, . . . .	Maestricht, Burenmonde, Venloo.
Luxemburg, . . .	Luxemburg.

The census of 1880 gave the area at 32,972 square kilometres, or 12,648 English square miles, with a population of 4,012,693, comprising 1,983,164 males and 2,029,529 females. The average density of the population is about 830 per square mile, being greatest in South Holland, where it is 740 per square mile, and nearly the same in North Holland, the population there, however, being chiefly concentrated in towns.

The term Holland signifies a low, concave, or hollow tract, to which the Netherlands (*Nederlanden*) of the natives exactly corresponds in meaning, and which the French express by *Les Pays Bas*, or the Low Countries.

The pure Dutch, or Netherlanders, numbering about 2,500,000, inhabit the provinces of North and South Holland, Zeeland, Utrecht, and Guelderland; the Friesians, speaking a dialect of the Dutch language, are dispersed, to the number of 500,000, through Overijssel, Drenthe,

Groningen, and Friesland; while North Brabant is almost entirely inhabited by a Flemish population.

• *Surface, Lakes, Rivers.*—The Netherlands are part of the great plain of Northern Europe, and are not separated from Germany by any natural boundaries. They form one unbroken flat without a hill or rock, without forests or running waters; they lie for the most part even below the level of the sea, against the inroads of which they are protected by immense dykes and by sandhills or *dunes* from 80 to 180 feet high, which have been cast up by the ocean. From the Helder to the mouth of the Maas, a distance of 75 miles, these gloomy though protecting deserts everywhere extend between the cultivated country and the sea. The land thus rescued from the sea, consisting of moor and mud, is traversed by numberless canals, which are absolutely necessary to drain it and render it fit for cultivation. The eastern provinces nearest to Germany contain many meres and marshes, and especially the great series of turf moors which extend from the mouth of the Schelde eastward to the Maas, and there join the great morass called the Peel.

The whole coast, which is much broken and indented with considerable bays, large inlets of the sea, and the mouths of great rivers, measures nearly 500 miles. The Zuider Zee has been formed by the irruption of the ocean into a former Lake Flevo. It is 80 miles long from north to south, and its breadth varies from 20 to 30 and 40 miles. It is bordered seaward by the islands Texel, Vlieland, Schelling, and Ameland. Schemes have been proposed for the recovery of its submerged land by drainage. The Lauwer Zee, the Dollart, and the Bies Bosch have been formed by similar irruptions. The most important river is the RHINE. The other principal rivers are—the Maas, Meuse, or MEUSE, which comes from Belgium, and joins the Waal at the fort of St. Andries; and the Schelde, which, likewise coming from Belgium, enters Holland below Antwerp, and divides into two arms, the East and the West Schelde; the West Schelde falls into the ocean at Flushing, and the East Schelde between the Zealand islands of Schouwen and North Beveland. The famous ship-canal from Amsterdam to the Helder, designed to avoid the shallows of the Zuider Zee, is nearly 50 miles in length. It was constructed at an immense expense, and of sufficient depth and breadth to carry the largest vessels of the period. But it did not answer the expectations formed of it, and it was a circuitous and expensive route. The Amsterdam Canal was therefore constructed and opened in 1877 to provide direct communication westward with the North Sea, through the formerly shallow lakes of Y and Wykeer Meer, and across a narrow neck of land.

The largest lake formerly was that of Haarlem, which took the place of meadows, gardens, and the populous village of Nieuwenkirk. Upon the drainage of this lake by gigantic steam power—completed in 1852—remains of the unhappy village were found, with bones of the inhabitants.

*Climate, Natural Productions, Manufactures, Trade, and Commerce.*—The climate of Holland is less extreme than in North Germany generally; the mean temperature of the year at AMSTERDAM, the capital, being 49° 6'—in summer 64° 4', and in winter 35° 6' Fahr., but the thermometer sometimes rises to 80° or 90° in the autumn. Little snow falls, but the canal from Amsterdam to the Helder is frequently frozen for three months in the year, and even the Zuider Zee is often frozen in the month of January. The atmosphere is humid and unhealthy for strangers, especially in the western provinces. Tempests are frequent in winter and spring. The great amount of stagnant water would render the country uninhabitable but for the strong winds, which purify the atmosphere.

There are extensive deposits of turf and potter's clay, but very little coal. No stone of any size is to be found

in the soil; and though, generally speaking, it is not a wooded country, large trees are by no means rare. The flora resembles that of other European countries situated in the same latitude, but aquatic plants are more varied and extensive. Horticulture has long been a favourite employment of the Dutch, especially at Haarlem, which exports tulip, hyacinth, and other flower roots in considerable numbers. The most fertile provinces are those of the south, and the least so those of the north. Fifteen-fourths of the entire land are in pasture. No law of primogeniture exists. The quantity of land held by each farmer may be said to vary usually from 50 to 125 acres, according to the province. The largest proprietorships are in Zeeland, where there are farms of several hundred acres. The chief crops are oats, wheat, rye, barley, buckwheat, and potatoes; flax is extensively cultivated in the southern provinces, tobacco in Utrecht and Guelderland, and the vine in Luxemburg; potatoes, hemp, rape-seed, chicory, mustard, hops, and beet-root are grown generally. Sufficient corn for home consumption is not raised. Small fruit and vegetables are abundant; and bees are extensively reared in the provinces of Guelderland, Drenthe, and Utrecht. Rabbits and hares abound, as well as deer, pheasants, and partridges; and water-fowl and reptiles in the marshes. Storks are numerous, and almost superstitiously revered in some districts. Measles are taken to prevent their destruction and to augment their number. Cattle and draught horses are of excellent breeds and very numerous, as well as sheep, goats, and pigs. Dairy work is the chief rural industry; butter and cheese are in great repute, and form objects of extensive commerce. The coasts abound in cod, turbot, sole, and other flat fish. Indeed, the fisheries formed the origin of prosperity in the Netherlands, and the herrings prepared by the Dutch still maintain their superiority. The whale fishery in the Sea of Spitzbergen has been carried on since the sixteenth century, but has now greatly declined.

The absence of coal, which is worked only in Limburg, and the prevalence of strong winds, have led to the adoption of the windmill as a motive power, and it is largely employed, although the steam-engine is now often used. In such a low country the management of dykes, canals, and roads must be a special object of attention on the part of the government. The roads which are formed on the dykes, and bordered by canals, are excellent. Since not only the surface, but the bed of many of the canals is above the level of the adjoining meadows, the land has to be drained by means of pumps, which are worked by windmills.

In ancient times the Netherlands suffered greatly from floods, and is even now subject to frequent inundations: the most disastrous of recent years was that of 1855, which overwhelmed the town of Veendam and an extensive district in Guelderland.

The principal manufactures are the finest linen, woollens, silks and velvets, paper, leather, and tobacco. The manufacture of cotton has been introduced. The principal exports of cotton fabrics go to the Dutch East India possessions. The chief seats of the cloth manufacture are Leyden, Utrecht, and Tilburg; silk and velvets—Utrecht, Haarlem, and Amsterdam; and linen at Haarlem. Gin—also called "Hollands" or "Geneva" (properly *jenever*, from the juniper berry, with which it is flavoured)—is distilled in immense quantities at Schiedam; and Amsterdam has the largest diamond-cutting trade in the world—10,000 persons being dependent on it. In the latter city there are also extensive sugar refineries, and large quantities of tiles and bricks are made at Utrecht and Leyden, particularly a small kind of hard bricks, called clinkers, which are used for paving the roads between many of the larger towns. There are also iron and cannon foundries, gunpowder mills, and saltpetre factories. Paper is made

chiefly in the provinces of Holland and Guelderland, and there are type-foundries at Haarlem and Amsterdam. Shipbuilding, in which the Dutch display great skill, is extensively carried on at Amsterdam and Rotterdam, and throughout the whole country manufactures of almost every kind are prosperous.

In consequence of the numerous canals with which the country is intersected, the advantages of railway communication were long very little known. Under the fostering care of the state they are now rapidly increasing in extent, and the various towns are being linked one by one to the commercial centres of Belgium, and so to those of the whole of Europe. From the north-west and north-east the lines converge towards Utrecht, and extend southward to Endhoven, where the railways meet from Venlo on the Meuse westward, and Bergen-op-Zoom eastward; thence Liège is reached direct, with the great system of Belgium lines.

It is singular that personal property is nearly twice as valuable as landed property, owing to the saving habits of the people. The wealth of the country is distributed among many persons, and large fortunes are very exceptional. Taking the whole of Holland's merchant shipping, it has been on the decrease, the tonnage of 1866-70 having been 1,273,000, whereas in 1887 it was but 875,000. The decrease, however, has been altogether in the direction of sailing ships, the tonnage of which has fallen from 1,221,000 to 587,000, while on the other hand steamship tonnage has risen from 51,000 to 288,000.

The Dutch (really only a form of the German *Deutsch*) are marked distinctively from the neighbouring nations, resembling the English in many respects, especially in their home pride. The artisan is generally warmly and substantially clothed, and admirably housed. He must have a house to himself, however small, and in all towns his wants are studied in this respect; miniature houses abound, and are patterns of scrupulous cleanliness. There is little active legislation specially affecting the industrial classes, and the hours of labour are not limited either for adults or children. Combinations for the purpose of altering wages are sternly forbidden by the penal code, and all differences are settled by a mixed committee of workmen and employers of labour. The general well-being of the country is remarkable, and there appears to be very little acute distress.

The commerce of the country has greatly increased within modern times. The imports from Great Britain, Germany, and Russia have nearly doubled. In addition to her European trade, the Netherlands have a very extensive commerce with the East Indies, especially Java. The total imports are valued at over £80,000,000 per annum, and the exports at over £60,000,000. The trade between the United Kingdom and Holland in recent years was as follows:—

#### IMPORTS FROM HOLLAND

(Chiefly cattle, butter, cheese, and sugar).

1884, . . . . .	£25,876,898
1885, . . . . .	25,007,582
1886, . . . . .	25,309,949

#### EXPORTS FROM THE UNITED KINGDOM TO HOLLAND.

Year.	British and Irish Produce.	Foreign.	Total.
1884,	£10,237,946 ..	£7,902,093	£18,280,039
1885,	8,878,080	6,971,386	15,849,466
1886,	8,195,974 ...	6,815,527 ...	15,011,501

**Constitution and Government.**—The present fundamental law—*grondwet*—of the Netherlands received the royal sanction 14th October, 1848, and was solemnly proclaimed 3rd November, 1848. This charter vests the whole legislative authority in a Parliament composed of

two chambers, called the States-General. The Upper House, or First Chamber, consists of thirty-nine members, elected by the provincial diets from among the most highly assessed inhabitants of the various counties. The Second Chamber of the States-General is formed of one member to every 45,000 of the population, elected by ballot. All citizens are voters who are twenty-five years of age, natives of the Netherlands, not deprived of civil rights, and pay assessed taxes to an amount varying from twenty guilders (£1 13s. 4d.) for the poorer districts to 112 guilders (£9 6s. 8d.) for the richest and most populous electoral district, Amsterdam. Clergymen, military officers in active service, and judges, are debarred from being elected. The members of the Second Chamber receive an annual allowance of 2000 guilders, or £166, besides travelling expenses. Every two years one-half of the members of the Second Chamber, and every three years one-third of the members of the Upper House, retire by rotation. The sovereign has the right to dissolve either of the chambers separately, or both together, at any time. The cabinet ministers must attend at the meetings of both houses, and have a deliberative voice only unless they are members. All financial measures must originate in the Second Chamber, and the assent of both the sovereign and the Upper House is required before any bill which has passed the House of Representatives becomes law. The royal veto is seldom, if ever, brought into practice.

The executive authority is in the hands of the sovereign, and exercised by him through a responsible council of ministers, each of whom has a salary of 12,000 guilders, or £1000 per annum. Whenever the sovereign presides over the deliberations of the ministry, the meeting is called a "cabinet council," and the privilege to be present at it is given to all princes of the royal family who are of age. There is also a Privy Council of fourteen members, all nominated by the government, which the sovereign may consult on extraordinary occasions. The king, according to the terms of the constitution, has a civil list of 600,000 guilders or £50,000 per annum; while an additional sum of 150,000 guilders, or £12,500, is appointed as allowances for the princes or princesses of the royal family and the maintenance of the court. The crown is hereditary in the male line, and by default of that in the female. The crown prince bears the title of Prince of Orange, and attains his majority at eighteen. The king nominates the governors of provinces and the burgomasters of the cities, towns, and villages. The usual residence of the court is at the HAGUE.

**Church and Education.**—According to the terms of the constitution, entire liberty of conscience and complete social equality are granted to the members of all religious professions. The royal family, and a majority of the inhabitants, belong to the Reformed Church, which is Calvinistic in point of doctrine, but the Roman Catholics are not far inferior in numbers, and there are many Jews in the large towns. The government of the Reformed Church is Presbyterian; while the Roman Catholics are under an archbishop, of Utrecht, and four bishops, of Haarlem, Breda, Burenmond, and Herzogenbush. The salaries of several British Presbyterian ministers, settled in the Netherlands, whose churches are now incorporated with the Dutch Reformed Church, are paid out of the public funds; and the state also contributes to the support of the ministers of other denominations.

In the matter of education the Netherlands does not admit the principle of compulsory instruction. In 1885 there were 4000 primary schools, containing 570,000 pupils, of whom 280,000 were educated gratuitously; but it is calculated that there are 71,000 children not receiving any education at all, and at least 10 per cent. of the conscripts and 26 per cent. of prisoners cannot read or write. There are four universities at Leyden, Groningen, Amsterdam,

and Utrecht, with 1500 students in 1885, and a polytechnic institution at Delft with 350 pupils. The ecclesiastical training schools comprise five Roman Catholic and three Protestant seminaries. There are numerous academies of the fine arts; and institutions for deaf-mutes and the blind. The benevolent institutions comprise hospitals for the sick and infirm, and for orphans; societies of public good, and several pauper colonies. Mendicity is interdicted throughout the kingdom.

*Revenue and Expenditure.*—There have recently been considerable deficits in the finances of the Netherlands, these deficits being partly caused by expenditure on public works, which are paid for out of revenue each year. There is a separate budget for the great colonial possessions in the East Indies, voted as such by the States-General. The financial estimates for the year 1886 calculated the total revenue at 115,149,065 florins, with an expenditure of 130,943,648 florins. The heads of the budget of the Dutch East Indian possessions for the year 1886, as approved by the States-General, presented the following totals, viz.:—

	Florins.
Expenditure, . . . . .	130,655,706
Revenue, . . . . .	134,217,660
Deficit, . . . . .	5,438,046

The government has pushed forward numerous railways. Their working is confided to a public company, and, as a matter of finance, they only pay to government a dividend of about 1 per cent. There is a national debt, which in 1886 amounted to £90,000,000, having been reduced to this amount from £101,500,000 in 1850. The revenue of the Netherlands is derived chiefly from direct taxes, on land and assessed, excise duties, those on spirits being the principal among these, from stamps, and from the profits of the colonial produce.

*Army and Navy.*—The army of the Netherlands is formed partly by conscription and partly by enlistment, in such a manner that the volunteers form the stock as well as the majority of the troops. The men drawn by conscription at the age of twenty have to serve, nominally, five years; but practically, all that is required of them is to drill for a few months, and, returning home on furlough, meet for a fortnight annually for practice, during a period of four years. Besides the regular army, there exists a militia—"schutters"—divided into two classes. To the first, "the active militia," belong all men from the twenty-fifth to the thirty-fifth year of age; and to the second, the "resting (*rustende*) militia," all from thirty-five to fifty-five. The two comprise about 80,000 men; and the strength of the regular army in time of peace is about 70,000. The country is strongly fortified in every direction. The colonial troops are 30,000 in number, of whom about 12,000 are Europeans and the remainder natives.

The navy was composed in 1887 of two turreted corvettes, four turret ships for coast service, seventeen monitors, sixteen first-class and seventeen second-class gunboats, twenty torpedo boats, nine first-class and seven other cruisers, eight sailing vessels, thirteen school vessels, fourteen other steamers, and thirty steamers, mostly small, for service in the East Indies. The government spends from 2,000,000 to 3,000,000 florins annually (£160,000 to £250,000) in strengthening its various means of defence. The Netherlands have some small fortresses and a great many forts connected with each other, which would serve, with the aid of inundations, to defend the interior of the country, while most of the routes from the coast are fortified. With a territory not much larger than Wales, this country maintains an army, a fleet, and a commerce ranking high among the states of Europe.

*Colonies.*—The colonial possessions are more extensive and valuable than those of any other kingdom except Great

Britain. They comprise Java and Madura, large portions of Sumatra, Borneo, Papua, Celebes and Moluccas, Timor, Bali and Lombok, many of the smaller isles of north-west Oceania, Surinam or Dutch Guiana in South America; and the islands of Curaçoa, St. Eustatius, Saba, &c., West Indies. Total area in Asia, 615,000 square miles, population 28,000,000; in America, 60,000 square miles, population 96,000. The possession of part of Sumatra involved the Dutch in a war with the Sultan of Acheen in 1873, and it was only after serious difficulties that peace was concluded in 1874, giving substantial acquisitions to Holland. Slavery ceased in the West Indian colonies on the 1st of July, 1863, the owners receiving £25 for each slave.

*History.*—Julius Cæsar, during his conquests in Northern Gaul, advanced as far as the Rhine. In the fifth century the Batavians, and in the sixth the Belgæ, were conquered by the Franks, but the Frieslanders not till the seventh century. At the peace of Verdun, in 843, Batavia and Friesland were incorporated with the newly created kingdom of Germany, and were under governors, who afterwards made themselves independent. Of all these princes the counts of Flanders were the most powerful, and their country having become subject, in 1383, to the still more powerful house of Burgundy, the latter made itself master of almost the whole of the Netherlands. The country afterwards passed into the hands of Austria, and then into those of Spain. During the reign of Charles V. the Protestant religion began to spread. His son and successor, Philip II., introduced the Inquisition, and carried on religious persecution with a cruelty before unknown. The people rose in open rebellion, which the atrocities of the bloodthirsty Alva could not quell. In 1579 the five provinces of Holland, Zealand, Utrecht, Guelderland, and Friesland concluded the celebrated Union of Utrecht, in which they declared themselves independent of Spain. They were joined in 1580 by Overijssel, and in 1581 by Groningen; and they thus formed the celebrated republic of the Seven United Provinces. In accomplishing this noble end, the Dutch were mainly guided by William the Silent, prince of Orange, who was assassinated by a fanatic, Balthazar Gerard, in 1584. The story of the rise of the Dutch commonwealth has been told with great vigour by Mr. Motley. Towards the end of the seventeenth century they were engaged in war with France and England, and at the beginning of the eighteenth century in the War of the Spanish Succession. Holland was weakened by these efforts, while republican jealousy of the attempts of the house of Orange to increase its authority sowed the seeds of party rage and civil war. In 1747 the house of Orange triumphed, and William IV. obtained the hereditary dignity of stadtholder in all the seven provinces. In 1794 the republican or anti-Orange party, encouraged by the approach of the victorious armies of France, again rose; and for twenty years Holland suffered alike from the hostility of the English and the control of the French. Louis Bonaparte, the brother of the Emperor Napoleon, was appointed King of Holland, 5th June, 1806, but after a reign of four years he abdicated, rather than be the mere instrument of his brother's ambitious policy. In 1813 the Prince of Orange returned, and governed the country by the title of "Sovereign Prince," till 1815, when the seven northern and the ten southern provinces, after a separation of 200 years, were again united, by the name of the kingdom of the Netherlands. This kingdom lasted till 1830, when a revolt of the Belgians led again to a separation of the seventeen provinces into two kingdoms.

*Literature, &c.*—It is a remarkable fact that, compared with other nations and languages, very little is known in England, either of the Dutch national character, in so many respects resembling our own, or of their tongue, though the study of it is calculated to throw so much light upon English, which has not only the same common origin, but has directly borrowed a great number of words and expres-

sions. In Holland, on the contrary, not only is French spoken fluently by the upper classes, but they are also generally proficient in English, and some knowledge of English is common with the middle and lower grades of the people; and after a little experience the Englishman and the Dutchman, only accomplished in their native speech, may communicate as to every-day wants without much difficulty, owing to similar forms of expression. "Brood om Koekbakker," "Koffy en Thee te Koop," inscriptions over shop-doors, cannot long remain a puzzle, though not quite so intelligible as "Tabak, Snui, en Sigaren."

Although they now stand in somewhat the same degree of relationship to each other as the English and Scotch, the Dutch and Flemish languages were originally the same. The difference between them has been occasioned by that of the northern provinces having been cultivated and refined and employed in literature, while the other has continued almost stationary in its primitive rudeness. Even in the twelfth century the Dutch began to be used in public decrees and civil acts; nor was it long before writers arose who began to mould it into rhythm. Jacob van Maerlant, Melis Stoke, Jan van Hele, Thomas van Ghessart, Heijuric van Holland, were all writers of the thirteenth century. In the fourteenth sprang up the literary societies known by the name of the "Kamers der Nederijckers," or "Chambers of Rhetoric," but which, so far from advancing poetry, rather corrupted the language itself.

Of the services of Erasmus both to letters and to religious liberty, or of the share which Holland took in the Reformation, it is not our purpose to speak; neither can we bestow any notice on those writers of the sixteenth century who obtained celebrity by works of erudition or science. The period we now arrive at may be considered as not merely the dawn but the morning of Dutch literature; and one of the first who contributed towards purifying and refining the native tongue was Dirk Volkertsoon Koorhert. Among other contemporary names of note appear those of Philip van Marix, Peter Heijns, Spieghel, and Roemer-Visscher. The era from the commencement of the seventeenth century to 1679, the time of Vondel's death, comprises some of the most illustrious names in the literary annals of Holland—those of Hooft, Cats, Decker, Kamp-huyzen, Anso, and Antonides van der Goes. Next came Grotius, Erasmus, Scaliger, Boerhaave, Heinsius, and Barlaeus, who wrote chiefly in Latin. Among those who wrote in Dutch were Huygens, Jan Vos, and Anna and Maria Roemer-Visscher.

The greatest Dutch writer perhaps was Vondel, who wrote tragedies, odes, and lyrical and satirical pieces. Mr. Gosse has pointed out many remarkable anticipations of Milton in Vondel as to imagery and situation, &c., but all curiously far removed in style. Jan Antonisz, or Antonides van der Goes, Vondel's friend and pupil, was gifted with great power of imagination, and his "Ijstroom" is considered one of the best descriptive poems in the language. Towards the close of the seventeenth century French literature began to find imitators, and for a short time originality was checked. Elizabeth Koolaert was the best Dutch writer of this period.

The first half of the eighteenth century was marked by the productions of Van Effen and those of Poot, Hoogvliet, Schim, Feitama, De Marre, Steen-wijk, and Langendijk. These writers cultivated a wide range of poetry and dramatic literature; and among those of lower distinction were Peter Boddaert, Frederick Duim, Dirk Smits, and Adrian van der Vliet. Peter Langendijk, originally a danusk weaver by trade, was one of the principal comic dramatic writers of this period; and that he possessed a natural genius for comedy can hardly be denied, when it is known that his "Don Quixote," which is still a stock-piece of the Dutch stage, was composed by him at the age of sixteen, though afterwards considerably improved. His "Alexander the Great," in which a countryman is served as

Christopher Sly was, and made to believe, on waking, that he is the Macedonian hero, is highly comic, though defective from its want of interest in the plot.

In the latter half of the same century appeared William and Onno van Haren, two brothers, who produced many fine poems; of which the best is Onno's "Geuzen" (first published in 1769, under the title of "Het Vaderland"), which is not so much an epic as a cycle of national poems celebrating the leading events in the history of the Netherlands. Upon the whole, this production is the *chef-d'œuvre* of Dutch literature in the eighteenth century. Lucretia Wilhelmina van Merken, or Madame van Winter, the most distinguished female poet of the century, acquired great reputation by her "David" and her "Germanicus." Her husband, Nicolaas Simon van Winter, was also a poet of considerable ability. Jan Noms, Lucas Trip, Voet, Bellamy, the Baroness de Lannoy, Kastelyn, Nienwland, and Van Alphen, were among the distinguished poets of the same period. Bellamy was not only a genuine poet, but he gave a fresher and more energetic tone to Dutch literature, and was almost the very first who ventured to shake off rhyme. Bellamy's is perhaps the only poetry which the Germans have transplanted from the literature of Holland into their own. The two attached friends, Elizabeth Bekker (Wolf) and Agatha Deken, both of whom died on the same day, may be considered as the first who introduced the modern novel into Holland; their productions were eminently successful, and some of them were translated into German. Petronilla Moens, Simon Stijl, Peter Leonard van de Kasteela, and Arende Fokke, are among the other names of the same century. In art Holland has also produced some illustrious names, and the connoisseur values the masterpieces of Rembrandt, Gerard Dow, Metzju, Jan Steen, Paul Potter, and Ary Scheffer.

**NETLEY HOSPITAL**, or Royal Victoria Hospital at Netley, is a large building on the shore of Southampton Water, for the reception of invalids from the army, and for the training of army surgeons and nurses. In time of war 1000 patients could be admitted, but during peace only a portion of the hospital is used. The annual charge is about £4500 in time of peace, exclusive of that for the medical staff, which varies in proportion to the work to be done. The building has every convenience for landing patients from foreign service at its very doors, and is constructed on the most approved principles. It was built at a cost of £350,000.

**NETS and NETTING.** The process of netting differs from weaving in two respects—first, that the threads are knotted at the places where they cross each other at right angles; and secondly, that large open spaces called meshes are left between the threads. Nets have been used from the earliest times, not only in civilized nations, but by the most barbarous tribes. Till recently all nets were made by hand, and in many places are so still, though machinery has been applied to the process with the greatest success. Hemp and flax are the materials used, generally in the form of twine, when nets are made by hand; but since the adaptation of machinery to net-making cotton has been increasingly used.

Fishermen's nets are of various kinds. The *seine* net is a very long one, but not very wide, one side of it being loaded with lead to make it sink, the other with cork to buoy it up; so that when put in the water it forms a sort of net-wall, sometimes as much as 400 yards long. It is taken round a shoal of fish by boats and then dragged ashore. The *drift* net is similar, but not loaded with lead, and is used for mackerel fishing. The drift nets catch the fish behind the gills, the mesh being just large enough to let the head of the particular fish for which it is made pass through; the body is unable to pass. The fish, feeling itself caught, attempts to swim back again, but the edges of its gill-cases now catch in the net, and it is held tightly. The

fish may be said to hang themselves in the net. The *trawl* is dragged along the bottom by the fishing boat, its great mouth held up by a beam along the top edge, and kept open by two large irons somewhat in the shape of stirrups. This mouth leads into a long bag of network, into which all kinds of fish are swept as the net is dragged through the water. The boats clap on all sail when the net is down, since the faster the net is drawn the more surely are the fish prevented from swimming out of the net again. Nets are also used for catching birds and animals, and by gardeners to protect crops or seeds from birds.

**NETTLE**, a name applied to various plants. The true nettles are various species of the genus *Urtica*, well known for their stinging properties, which are owing to the presence of an acrid poisonous secretion, that in some Indian species is so dangerous as to cause excruciating pain, and even death. Nettle is the same word as the Anglo-Saxon *nædel*, a needle, which is applied to these plants on account of their possessing small stinging hairs. This genus is the type of the order URTICACEÆ. Most of the species are herbaceous plants or under-shrubs, and are found in Europe, Asia, and America. The Roman Nettle (*Urtica pilulifera*) is found in the east of England. It is the most virulent of our native nettles. The Great Nettle (*Urtica dioica*) is very common throughout Europe. The tops, when young in spring, are sometimes eaten as a potherb. The Small Nettle (*Urtica urens*) possesses the stinging properties of the last two. It is common in cultivated ground, especially gardens, throughout Europe.

Though nettles are so common in Europe, the finest species are found in tropical countries. They extend from the Malayan peninsula all along the Himalaya Mountains; and some of them, from the beauty of their foliage, might even be ranked among ornamental plants. Several Indian species do not sting, but others possess this property in a very extraordinary degree: for instance *Urtica heterophylla*. The most important species is *Urtica tenacissima*, for, like some of the other nettles, as well as the hop and the hemp, belonging to the same order, it abounds in ligneous fibre, which may be converted into strong cordage. Dead-nettles are species of *Lamium*, monopetalous plants belonging to Labiata, and wholly inert. See NETTLE-TREE.

**NETTLE-RASH** (Urticaria) is an eruption of the skin, in appearance and feeling very much like what would be caused by the stinging of nettles, and hence its name. It proceeds from some derangement of the digestive organs, and is often brought on by eating special articles of food, such as nuts, cucumbers, oysters, crabs, and mussels, and also occasionally from the use of certain drugs, such as henbane, copalba, cubebs, turpentine, &c. It is often accompanied by feverishness, giddiness, and nausea, followed by vomiting and diarrhœa, which act as a natural cure. When this is not the case a tonic-aporent medicine, combining sulphate of magnesia with quinine and a bitter infusion, will generally afford immediate relief. With some persons of very bad digestion the disease is a chronic one, and the eruption takes place at frequent intervals. If this is not caused by some particular article of diet, which can be easily left off, medical advice should be taken as to the best manner of improving the digestive powers. For the relief of the local irritation the best remedy is a lotion of lime water and the oxide of zinc, one part of the latter to eight of the former.

**NETTLE-TREE** (*Celtis*) is a genus of trees nearly allied to the elm, and belonging to the order URTICACEÆ. The fruits differ considerably from that of the elm, being hard fleshy drupes; they are sweet and considered very wholesome. The European Nettle-tree (*Celtis australis*) is abundant along the shores of the Mediterranean, and the fruits are called in Greece honey-berries. In the south of France and Italy it is planted in the squares, and often grows to a height of 40 feet. The wood is hard, and is

used by cabinetmakers. The North American Nettle-tree or Sugar Berry (*Celtis occidentalis*) is a hardy and ornamental tree; the leaves remain late. The Hackberry (*Celtis crassifolia*) is a native of Virginia, Kentucky, and Tennessee. The leaves are broader at the base, thick, and rough on both sides.

**NEUCHÂTEL** (generally written *Neuchâtel*, but called *Neuenburg* by the Germans), a canton of Switzerland, situated on the borders of France, in the Jura Mountains, which here form several parallel narrow ridges running in the direction of north-east to south-west, and separated by elevated longitudinal valleys. The greatest length of the canton is about 31 miles; the greatest breadth 13 miles. The area is 308 square miles, and the population in 1881 103,732, mostly Protestant. Pastures occupy the greater part of the surface, but good wines are exported to the adjacent cantons. Except wine, kitchen vegetables, and hay, the vegetable products are insufficient for home consumption, and corn is imported from the cantons of Bern and Basel. Many cattle are reared, and a considerable quantity of cheese is exported. The minerals are principally coal and iron. From 18,000 to 20,000 persons are more or less employed in watchmaking, both in the urban and rural districts. Cotton and lace fabrics—for export to the Netherlands, Prussia, Belgium, and Italy—hosiery, cutlery, and metallic wares generally, are the other chief manufactures.

The language of the people is French, which is spoken correctly by educated people, but the country people speak various patois resembling those of their neighbours of Franche-Comté and of the Canton de Vaud. Neuchâtel joined the Swiss Confederation in 1815, and its connection with the Prussian crown ceased in 1857.

NEUCHÂTEL, the capital of the above canton, is built on the north-west shore of the lake, 25 miles west of Bern. The population in 1881 was 15,612. It has an ancient castle, which was built in the thirteenth century, and near it a cathedral, which dates from the tenth century, and contains the tombs of the ancient counts of Neuchâtel. The Reformation was preached in this church in 1530. In the lower town are the hôtel-de-ville, the hospital for the burgesses, the orphan asylum, the hospital founded in 1810 by Pourtales the wealthy merchant, and a fine college, which contains a public library and a cabinet of natural history. The lower town, generally speaking, is well built, and has a fine appearance when seen from the lake. Neuchâtel has a good trade in wine and watches, the latter being mostly sent to Geneva.

NEUCHÂTEL, LAKE OF, the *Lacus Eburodunensis* of the Romans, called also the *Lake of Yverdun*, is 25 miles long, and from 3 to 5 broad. Its greatest depth towards the middle is between 400 and 500 feet. Its feeders are the rivers Orbe, Broie, Reuse, and Seyon. The outlet is the Thiele at the north-east extremity, which carries its waters into the neighbouring lake of Bienné, whence there is an outlet into the River Aar. The basin of the Lake of Neuchâtel belongs to the water-system of the Rhine. The level of the lake was formerly 1420 feet above the sea, but owing to an enlargement of the outlet it has been lowered about 7 feet.

**NEUKOMM, THE CHEVALIER SIGISMUND**, a musical composer of the early part of this century (born at Salzburg 1778, died at Paris 1858), was a pupil of the great Haydn from 1798 onwards for some years. He then became for a time the court musical director at St. Petersburg under the Emperor of Russia. About 1810 he went to Paris, and there took a leading position in musical circles. At the Restoration his Requiem for King Louis XVI., guillotined in the Terror, so gratified that prince's brother, Louis XVIII., the reigning monarch, that he created Neukomm a chevalier of the Legion of Honour, with letters of nobility. Neukomm went to Brazil in the service of the

king (the deposed King of Portugal) in 1816, but was driven home at the revolution which gave Brazil a temporary independence in 1821. He returned to Paris to the service of Talleyrand, with whom he had previously been connected. In 1829 he accompanied Mendelssohn to London, and was so much appreciated that he continued to divide his time between London and Paris till his death in 1858. His oratorio of "Mount Sinai" was a great favourite with our fathers, and that of "David," written for the Birmingham festival of 1834, created such enthusiasm that Neukomm was nicknamed "King of Brunnmagen." His really fine songs, "Napoleon's Midnight Review" and "The Sea" brought all music-loving England to his feet, until the arrival of Mendelssohn with "St. Paul" dethroned him from this great eminence. But he always remained a popular composer.

**NEUMES** (Lat. *neumæ*, from Gr. *pneuma*, a breathing) are the signs composing the musical notation of the dark ages, following the letter notation of the Greeks, and preceding the notation by points which we still use. Neumes are first definitely found in MSS. of the eighth century (figures like them are noticed even earlier, but upon them antiquarians are not yet agreed), and they lasted for five or six centuries later, varying very much of course as time went on.

The neumes rose out of the Greek accents; the grave (Λ) indicated that the singer should let the voice drop, the acute (∧) that he should raise the voice in pitch, the circumflex (Λ) that he should rise and fall on the same syllable. From these arose conventional little turns, trills, groups of notes, and cadences. Even in our own day musical signs of exactly similar import remain to show us the sort of thing these neumes were; for we still use one or two "graces," such as the shake and the turn (∞), of which our forefathers, who played the harpsichord, employed at least a dozen. Like these graces, each neume had its special interpretation. Similar breathings or neumes are used to this day in the Hebrew synagogues and in the Greek Church. They are and always were written in a row above the words to be chanted, rising as the music was meant to rise, falling as it was meant to fall.

Selecting at random, we may give the following few specimens of neumes, of which a list of forty is given in the codex of St. Blasien. Originally there were but seven or eight, as we know by the earlier lists of the Englishman John de Muris, &c.:—

The V-erg. The Punctus. The Punctus. The Cili. The Cephalicus.



Neumes therefore hardly served to enable a singer to read a piece of music at first sight, though they served perfectly well to remind him of what he had once learned. The following is an early specimen, quoted by Padre Martini in his "History of Music:—"

Cēlī cēlōz laudatē dēum

Soluti

At the beginning of the tenth century a red line was drawn horizontally above the words, marking the position of the note F (the bass F, now marked by the clef), and this made

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the neumes much easier to read, as it afforded a means for gauging their relative height.

**NEURALGIA**, a word of modern origin (derived from Gr. *neuron*, a nerve, and *algēd*, I suffer pain), first employed by Chausserie to designate a certain class of diseases of which the characteristic symptom is a most acute pain, following the course of a nerve in one or more of its ramifications, subject to paroxysms and intermissions, in many cases unattended by either heat, redness, or swelling, and often without any apparent lesion at all.

Among the predisposing causes of this disease the more important are hereditary tendency, malaria, anemia, and a condition of general debility, however brought about. Malnutrition, pregnancy, over-lactation, and profuse menstruation are each predisposing causes of this complaint, and it is a common sequel of relapsing fever. The immediate or exciting causes are very numerous and sometimes extremely obscure. Among the more common may be mentioned exposure to cold, especially damp cold, and mental excitement and agitation in persons of an irritable temperament. Local injuries of various kinds are another very frequent cause of this disease; such as the lodgment of any foreign body in the branch of a nerve, wounds, contusions, cicatrices, and the too great distension of a nerve. Often enough neuralgia is associated with toothache, and still more frequently a decayed tooth or long-forgotten stump, although not itself painful, is found on examination to be the exciting cause.

Neuralgic pains may occur in any part of the body, but are met with most frequently about the head and face, the variety known as *facial neuralgia* or *tic douloureux* being one of the most common forms of the complaint, and one of the most severe. It affects the great nerve of sensation of the face (fifth nerve), and may occur in one or more of the three divisions in which the nerve is distributed. It is less common for the third division to suffer than for the first and second, and though it often happens that two divisions are coincidentally the seat of neuralgia, it is very seldom that all three are affected at the same time. When the first or upper division of the nerve is involved the pain is mostly felt in the forehead and side of the head. When the second division of the nerve is affected the pain is chiefly in the cheek and upper jaw, the painful points being immediately below the lower eyelid, over the cheek bone, and about the upper lip. When the third division is attacked points of intensity may be found on the temple, a little in front of the ear, at the place of exit of the inferior dental nerve, at the side of the tip of the tongue, or more rarely in the lower lip. When the lingual branch of the fifth nerve is affected it involves the most exquisite suffering, but such cases are happily rare. Another form of neuralgia is that known as *hemicrania*, *migraine*, *brow ache* or *megrim*, in which the pain is usually limited to one side of the head, beginning with a dull aching pain in the temple, which gradually increases in severity. It is sometimes attended with impairment of vision, numbness, and tingling of extremities, impairment of speech, nausea, and vomiting. This complaint, which probably is not wholly neuralgic, has already been noticed under *MEGRIM*.

*Sciatica* is another of the more common forms of neuralgia, and it affects the great sciatic nerve, which emerges from the pelvis and passes down the leg to the foot. In this the pain may occur in the buttock, the back of the thigh, the knee, the front, back, and outside of the leg, and the whole foot except its inner border. It is in most instances traceable to exposure to cold or wet, to excessive exercise, strains, or to the presence of rheumatism or gout in the system.

The pain in most of the different forms of neuralgia is generally very severe. The first symptom is very often a feeling of numbness, the import of which gets to be well understood by persons liable to this disease, and this



is followed by pains of an intermittent character. The intervals between the darts of pain get shorter and shorter as the attack progresses, until the suffering is almost continuous, or is only interrupted by waves of intensity, and it will last for some seconds or more than a minute together. Then comes a respite, to be followed by a recurrence, and these alternations may be continued for hours. The pains are usually suspended during sleep, and though the patient may be kept awake for many hours by the pain, if once he can get to sleep his slumber is likely to be undisturbed. When the pain is at its worst there is often a radiation of it to other nerves, and very commonly during an attack certain definite points may be found where pressure is exceedingly painful. There is always a nerve branch under these points, and for the most part they occur in those places where the branches of the nerves emerge from bony canals, or find a passage through a muscular aponeurosis.

Some attacks of neuralgia run an acute course, lasting only a few days or weeks, but in others the disease is chronic, lasting for weeks and months, and even, if the successive relapses be included, for years. By itself it can scarcely be said to affect the duration of life, but it may be so persistent and troublesome as to render life itself a burden.

In the treatment of all forms of neuralgia it is of the first importance to ascertain, if possible, the remote as well as the exciting causes of the disease. If the affection arises from rheumatism, gout, anæmia, malaria, syphilis, or mineral poisoning, treatment appropriate to these conditions must be employed, or the most powerful and approved remedies for neuralgia itself will fail to produce any good effect. Where debility is the cause good diet, regular, gentle, and systematic exercise in the open air, a proper amount of rest and sleep, and the use of tonic medicines are the best methods of restoring the strength of the constitution. Anæmia, or poorness of blood, must be treated by iron, a good combination being fifteen drops of tincture of steel and six drops of tincture of nuxvomica in a wine-glassful of water three times a day. Quinine, croton chloral, phosphorus, chloride of ammonium, arsenic, and belladonna are all employed in the treatment of neuralgia, the first three of these drugs being especially efficacious. A remedy recently introduced, called Tonga, consisting of parts of at least two plants found in the Fiji Islands, has been received with much favour by the medical profession, and very excellent results have followed from its administration.

For immediate relief morphia may be injected hypodermically, and in cases where the pain is extreme this is a valuable means of alleviating the sufferings of the patient and affording him the rest needful to start more general treatment. Among other sedatives chloral, henbane, Indian hemp, and the various preparations of opium are often employed with advantage; but such remedies should only be resorted to under medical supervision, as there is always a danger of setting up the habit of indulgence in them. Many topical applications are of great efficiency in removing or mitigating the pain of neuralgic attacks. A small piece of the mild blistering paper, the size of a florin, applied to the temple or behind the ear, will generally relieve neuralgic pains of the forehead or any part of the face, and a piece of cantharides plaster, the same size, applied to the side will very often relieve the obstinate neuralgia left by shingles in that part of the body. The various liniments or ointments containing the preparations of opium, belladonna, or aconite are also used to rub into the skin over the affected part; but these, from their powerful nature, require the exercise of much care in their application. A liniment made by rubbing together equal parts of chloral and powdered camphor often affords almost instantaneous relief when painted on the painful part. Last, but not least, among the remedies for neuralgia we have the use of

the constant current of electricity. This must not be applied of a strength sufficient to cause pain or even severe discomfort, a force sufficient to cause the characteristic burning sensation being all that is required. The application should be made at regular intervals, at least once a day, but if it affords relief it may be repeated several times without injury.

Where neuralgia is unusually severe and prolonged, and is of a nature that renders it unsuceptible to ordinary treatment, surgical assistance may be required. Formerly the affected nerve was divided, and sometimes a portion was excised; but at the present day the operation of nerve stretching is preferred, and this is said to yield very satisfactory results.

**NEUROPTERA** is one of the orders into which the class INSECTS is divided. The insects composing this order may be distinguished by the following characters:—The wings are four in number, membranous, net-veined, generally naked, and more or less transparent, but sometimes hairy, the hind pair sometimes diminished in size or obsolete; the mouth is usually fitted for mastication, or furnished with mandibles and maxillæ; the larvæ are provided with six legs and are active. The body is elongated, the abdomen being especially long and slender.

With regard to the metamorphoses there is a great difference in this order. Some, and those the more numerous, pass through an incomplete metamorphosis, the larva going on actively eating and moulting till it reaches the perfect stage. In others the pupa is quiescent and the larva differs considerably from the perfect insect. Many entomologists restrict the name Neuroptera to the latter group, removing the former to the Orthoptera under the name Pseudo-Neuroptera. Packard, however, considers the dragon-flies (*Libellulidæ*) and May-flies (*Epheméridæ*), which belong to the Pseudo-Neuroptera, as the most typical of the Neuroptera, an order which he regards as the lowest among insects, and a collection of "synthetic types." The Neuroptera were abundant in Palæozoic times, sharing "with the Orthoptera the possession of the low marshy lands of Devonian and Carboniferous times, and the forms discovered in the rocks of those periods indicate that they were often of gigantic proportions, and among the most degraded of their type." Packard considers these Palæozoic insects as uniting more intimately, on the one hand, the true Neuroptera with the so-called Pseudo-Neuroptera, and on the other the whole order Neuroptera with the order Orthoptera.

Retaining then the old Linnæan order Neuroptera, it may be divided into several suborders. The Planipennia form the true Neuroptera of some authors. They have long thread-like antennæ, the two pairs of wings similar and densely reticulated, and the mouth strongly mandibulate. The family Sialidæ contains some of the largest of insects; the body is short and thick, with a huge square prothorax and bristle-like antennæ. In the genus *Sialis* and its allies the larva is predaceous and aquatic. In the genus *Rhaphidia* (Plate, fig. 4), containing the snake-flies, and sometimes made the type of a separate family, the larva lives under the bark of trees; the snake-flies are remarkable for the length of the prothorax. *Myrmeleon* (fig. 5), whose larva is the well-known ant-lion, is placed in the family Myrmeleontidæ. The Lace-wings (*Hémerobiidæ*, fig. 6) are beautiful little insects which feed on aphides. The Ascalaphidæ (fig. 8) have long-knobbled antennæ, and are adorned with bright and varied colours, so as to give them considerable resemblance to butterflies. The Panorpidæ or Scorpion-flies (fig. 7) are remarkable for having the mouth-organs situated at the end of a long beak; the Scorpion-fly (*Panorpa communis*), so called from the long forceps-like tip of the abdomen in the male, is a common British insect. Of the Pseudo-Neuroptera the Dragon-flies (figs. 1-3), *Libellulidæ*, are the most



typical and best known forms. Nearly allied to them are the May-flies (fig. 9), Ephemeridæ, which, however, live for a very short time as perfect insects, and in this stage take no food. The white ants, Termitidæ, are very remarkable insects, living in societies which contain beside the ordinary male and female two kinds of the so-called "neuters." A small tropical family, Enhiidæ, while resembling most nearly the Perlidæ, have some affinities with the termites. The Psocidæ have the hind wings small, or sometimes both pairs are wanting; they are the book-lice found in damp papers, &c. The Perlidæ are well-known to anglers as stone-flies; the mouth-organs are rudimentary. The Trichoptera (fig. 10) or CADDIS-FLIES either form a distinct order or a suborder nearest to the Planipennia. The MALLOPHAGA or bird-lice should be regarded as degraded Pseudo-Neuroptera.

**NEUSTADT**, a town of Austria, situated on the Vienna-Cloggritz Railway, at a distance of 25 miles south from Vienna, on an extensive plain on the navigable canal to Vienna, and at the junction of the Kehrbach and the little Fischa, not far from the frontiers of Hungary. The town was nearly destroyed by fire in 1834, and has been regularly rebuilt, nearly in the form of a parallelogram. It is divided into four quarters, and has in the centre a large and handsome square, surrounded with arcades. The principal building is the ancient archducal palace, built in 1186, and assigned in 1762 by the Empress Maria Theresa to the imperial military academy, which has a good library, a collection of philosophical instruments, a school for drawing, a bath, and a walled garden, 1400 yards long and 1200 broad. The old cathedral is a large stone edifice of the thirteenth century. Of the other buildings, the chief are—a Cistercian abbey, which has a library of 20,000 volumes and a beautiful collection of minerals and shells; two hospitals; and a gymnasium. Owing to its excellent means of communication, Neustadt carries on a brisk trade with Vienna, and with all the provinces of the Austrian Empire. It has extensive sugar refineries, cotton manufactories, breweries, and paper mills. The population is 20,000.

**NEUTER.** Originally, like all the Indo-European tongues, English had its neuter gender, which died out about 1350, when the general idea of gender (as apart from that of sex) died out. We now call males "he" and females "she," and apply these terms of sex practically to inanimate things, but really we may fairly be said to have no gender in our modern English.

Not so easy is it to see why the Romance languages, offsprings of Latin, though they retain the masculine and feminine genders (as real genders, and not merely as marks of sex), yet are devoid of a neuter, while Latin itself possessed the neuter in a very important and perfect development. Our forefathers heartily despised what they called Low Latin, refusing to read anything but the elegant Latinity of Cicero and his rivals and imitators; but modern philologists, less blind, grope among this Low Latin, or popular Latin, which quite in the early centuries of our era struck away from the literary Latin on paths of its own, and they discover in it, and not in the Latin of Cicero, the true origins of our modern Romance tongues, Italian, French, Spanish, &c. Now as early as Plautus (the great comic dramatist of Rome), who lived from 254 to 184 B.C., and who, as a comic writer, used the tongue of everyday speech rather than the pure language of literature, we find a tendency to masculinize neuter nouns. Plautus gives us *dorsus, avus, collus*, for *dorsum, avum, collum*, &c.; he does not shrink from *gutturum* as an accusative, &c. As time went on the people became (as Quintilian would have said) more ungrammatical, and in early inscriptions of our era we have constantly *monumentus, collegius, fatus*, &c. These are not errors but vulgarities of speech. Curius Fortunatianus, in A.D. 450, writes that "the Romans prefer to make their

slang words and many neuters masculine in gender, and talk of *hunc theatrum* and *hunc prodigium*."

By the side of this the nominative neuter plural, which always ended in *a*, was confounded by the common people with the nominative singular of the nouns of the first declension, which also ends in *a*, but are, with a very few exceptions, feminines. Thus *pecus*, cattle, gives a plural *pecora, vestimentum*, a garment, gives a plural *vestimenta*; but we find repeatedly in the fifth century MSS. such accusatives as *pecoras, vestimentas*, &c., only possible by assuming *pecora*, &c., to be feminine nouns. Thus all the neuters became, among the common folk, either masculine or feminine.

**NEUTRALITY**, a state of non-interference, of neither friendship nor hostility, to either of two belligerent parties. Perfect neutrality, as defined by De Martens, consists, first, in abstaining from all participation in the operations of war; and secondly, in behaving impartially in regard to everything which may be useful or necessary to the belligerents in respect of the war, either by granting or refusing to the one party what we have refused or granted to the other; or, at least, by continuing the same behaviour which we have maintained in time of peace. As long as a nation satisfies these duties she has a right to demand to be treated as a friend by each of the two belligerent parties, and to enjoy the independence which the law of nations assures to her, and which she is not obliged to sacrifice to the interests of the belligerent parties. In the absence of an effective BLOCKADE, the commerce of a neutral with either belligerent should be as free in time of war as in time of peace. Of the impolicy of any neutral government prohibiting the export of arms or other material by its subjects to a belligerent there can scarcely be two opinions. It would add immensely to the responsibilities of a neutral, and would lay it open to all sorts of claims on the part of the belligerent that conceived itself injured. It would be a most burdensome restriction on national industry, and would entail a very costly and exceedingly irritating system of official espionage, not only at the seaports, but also at the manufacturing centres of the country. To take care that no new duties are laid upon neutrals is obviously the interest of a great commercial nation like England. We have by the FOREIGN ENLISTMENT ACT—that of 1819, and the more stringent statute of 1870—excluded vessels capable of use for a belligerent purpose from the list of allowable contraband. The Neutrality Act of the United States has done the same. The governments of France, Italy, and the Netherlands have in time of war, while they were neutral, forbidden the equipment of belligerent vessels in their ports; but no nation except England and the United States has gone further than to prohibit the armament of a vessel fitted solely for fighting purposes. In case of a war breaking out between two countries, other nations usually make a proclamation of neutrality, the respective governments enjoining upon their subjects to abstain from in any way aiding either belligerent. ("The Rights and Duties of Neutrals," by W. E. Hall, London, 1874.)

**NEUWIED**, a town in the Prussian Rhine-Province and government of Coblenz, situated on the left bank of the Rhine, is a well-built town, with broad straight streets, and contains 9000 inhabitants. The chief manufactures are silk, cotton, broadcloth, lace, thread, hats, carpets, leather, tobacco, stockings, and tape. The principal edifices are—the ancient castle of the counts of Wied, with a museum of natural history, a library, and extensive gardens, several churches, and some schools. The buried Roman city of Victoria, about 2 miles from the town, furnished the materials for a collection of antiquities, which is now in the palace.

**NEVA**, a river of Russia, at the mouth of which St. Petersburg stands, flowing from Lake Ladoga, with a

• general western course, and discharging its waters into the Gulf of Finland by several mouths. Although it has only a course of 40 miles, its importance to the capital of Russia cannot be over-estimated, being connected with several canals, which again have communication with the most distant parts of the empire. Inundations frequently occur at the breaking up of the ice in April, especially when west winds prevail at the time.

**NEVADA**, one of the United States, North America, organized as a territory in March, 1861, and as a state in 1864, is bounded on the south and west by California, north by Oregon and Idaho, and on the east by Utah. The area is 83,500 square miles, and the population in 1880 was 62,265.

The state is an elevated, mountainous, and semi-desert region, but is exceedingly rich in minerals—gold, silver, mercury, lead, and antimony being found in great abundance. It is traversed by mountains which rise to the height of 6000 feet. It has no great rivers, but is crossed by the Union Pacific Railway. There are a few lakes with no outlet. The climate is dry. Carson City is the capital. The state has a large area of pasture land, but is chiefly noted for its rich silver mines, which yield four-fifths of all the silver produced in the United States.

**NEVADA, SIERRA.** See ANDALUSIA; GRANADA.

**NEVE** is the name applied to the granular and compacted snow that occurs on mountains above the snow-line. It is an intermediate stage between snow and *glacier ice*. The minute crystals of which the snow is formed, through successive thawings and refreezings, have become converted into rounded granules of compact snow or ice; these on being subjected to pressure pass into true glacier ice.

**NEVERS** (the *Noviodunum Aedurnum* of Julius Caesar), the capital of the French department of Nièvre, stands on the right bank of the Loire, at the junction of the river Nièvre, 183 miles south by east from Paris, and had 22,331 inhabitants in 1886. The town is built on the slope of a hill above the Loire, and presents a pretty aspect when seen from the left bank of the river. The chief public buildings are—the cathedral, now restored; the churches of St. Etienne and St. Saviour; the old castle, which forms one side of the principal square of the town; and the barracks. The bridge over the Loire has fifteen arches. The park of the dukes of Nevers contains one of the finest promenades in France. Nevers gives title to a bishop. It has a civil tribunal and a tribunal of commerce, Roman Catholic college, normal school, school of design, library with nearly 14,000 volumes, consultative chambers of arts, manufactures, and agriculture, theatre, &c. The inhabitants manufacture iron wares of massive character, chain cables, anchors, chains for suspension bridges, steam machinery and mill-work, &c. Agricultural implements, files, and other tools; earthenware, porcelain, enamel, cordage, violin-strings, glue, vinegar, candles, beer, leather, coarse woollen, and glass are also made. There is a commodious port for the river craft at the mouth of the Nièvre, and considerable trade is carried on in iron and steel, wood, coal, wines, leather, cattle, and manufactured goods. In the vicinity of Nevers was formerly the foundry of La Chaussade for cannons, cables, and anchors. It is now a practical engineering school. Near the town are the mineral waters of Pouges.

**NEVIS**, one of the Leeward Islands, is separated from St. Kitts by a channel about 2 miles wide, called the Narrows, which is navigable only by small boats. Nevis consists of a single conical mountain, of volcanic origin, rising with a gentle ascent from the sea-shore. The soil is for the most part a tenacious marl, and is very fertile, except on the high parts of the island, which are rocky and barren. Its area is 50 square miles, and the population 13,000. The government is united with that of St. Kitts. The chief exports are sugar, molasses, and rum.

The articles imported are mainly English manufactures, corn, flour, wheat, and provisions.

**NEVIS, BEN.** See BEN NEVIS.

**NEW BEDFORD**, a town of the United States in Massachusetts, situated on Buzzard Bay, 50 miles south of Boston, with which it communicates by railway. It derives its chief importance from the whale fisheries, almost three-fourths of the tonnage of the United States employed in these fisheries belonging to its harbour, but the trade has much declined of late years. The town has many elegant residences and public buildings, of which the chief are the city hall, the custom-house, and public library. The harbour is defended by a strong fort. There are now extensive manufactures of cottons, iron and copper goods, twist drills, Prussian blue, paraffin, candles, glass, &c. The population in 1880 was 26,845.

**NEW BRITAIN**, two large islands in the Pacific, situated between 5° and 7° 30' S. lat., and 148° and 153° E. lon. Up to the year 1700 they were considered a part of New Guinea or Papua; but in that year Dampier discovered the strait which separates both islands, called Dampier's Strait, and which is about 50 miles wide. New Britain is separated by St. George's Channel from the island of New Ireland. The area is estimated at 24,000 square miles. The interior contains mountains of great elevation. Along the shore there are several plains of considerable extent, and also some good harbours. The soil is fertile and produces the cocoa-nut, sago, and other kinds of palms; also bananas, yams, ginger, sugar-cane, the bread-tree, bamboo, and many other plants and trees. Dogs, pigs, turtles, and fish abound. The inhabitants, who appear to be rather numerous, resemble the inhabitants of Papua or New Guinea. The men are stout and well made, of a very dark colour, with curly hair. Both New Britain and New Ireland were explored in 1877 by the Rev. G. Brown, a Wesleyan missionary, who found that cannibalism prevailed. New Britain is one of the few remaining places where the Mooruk (*Casuarina Bennettii*) is still found.

**NEW BRUNSWICK**, a province of Canada in North America, bounded N. by the Bay of Chaleurs and Quebec, E. by the Gulf of St. Lawrence, Northumberland Strait, and Nova Scotia; S. by the Bay of Fundy; and W. by the State of Maine. The area is estimated at more than 27,322 square miles, and the population in the year 1881 was 321,129. The coast-line is 500 miles in extent, and is indented by numerous spacious bays, inlets, and harbours, which afford safe and commodious anchorage for shipping.

**Surface, Soil, and Rivers.**—The surface is undulating. A range of hills in the north extends from the falls of the river St. John to the Bay of Chaleur, attaining a height of 2170 feet, and forming the highest elevation in the lower provinces of British North America. The soil is fertile, but only a comparatively small portion is cleared, the rest being covered with dense forests, and the exportation of timber has been hitherto the principal source of wealth, amounting in value to more than £1,000,000 sterling a year.

The largest river is the St. John, which rises far in the west, and flows for above 200 miles through Lower Canada. It enters New Brunswick near 47° N. lat., and soon afterwards forms the Great Falls; its course is interrupted by many rapids, and it passes through a chain of lakes, of which the chief is Grand Lake. Its course through New Brunswick is about 220 miles. The Petitediac, which falls into Sheddy Bay, is about 70 miles long, and the tide flows up 40 miles. The Miramichi drains the centre of the central region with its numerous upper branches and falls into the Gulf of St. Lawrence, after a course of more than 100 miles; it is navigable for large ships for about 40 miles. The Nipiseguit River, which drains the northern region, and runs nearly 1000 miles, is much

broken by falls and rapids. The province also contains numerous lakes, one of which, Grand Lake, is 100 square miles in area. Most of the others are much smaller.

**Climate and Productions.**—The climate is of an extreme character; in spring, vegetation is very rapid. The autumn especially is a beautiful season, the air being clear and dry, and presenting a marked contrast to the dense fogs that prevail on some parts of the coast, in particular for some way inland from the Bay of Fundy. At St. John, with an altitude of 132 feet, the temperature ranges from 80° above to 12° below the freezing point; but at Fredericton, in the interior, the range is from 95° to -21° Fahr. In many places the severity of the winter has already been much mitigated by the clearing of the forest and the drainage of the ground.

As before stated, the great commercial wealth of this country consists in its extensive forests, which are composed of pine, fir, spruce, hemlock, birch, beech, maple, ash, elm, and poplar. Potatoes are the chief article of culture, but wheat, rye, oats, barley, beans, pease, buckwheat, flax, Indian corn, common vegetables, and fruits are also grown. On the alluvial grounds which occur along the banks of the numerous rivers there are fine meadows and pasture-grounds, and the rearing of live stock is increasing.

Wild animals are by no means numerous, though there are still bears, wolves, foxes, raccoons, minks, squirrels, and beavers. Wild geese, ducks, partridges, and pigeons are the most common game. The rivers abound with salmon, eel, trout, perch, &c., and the sea, near the shores, with cod, haddocks, mackerel, and herrings.

Copper, manganese, and iron are abundant; and the most valuable mines of bituminous and cannel coal yet discovered on the American continent were opened some years ago in Albert county. The coal yields 100 gallons of crude oil per ton. Indeed, the colony has a wide surface underlaid by carboniferous strata, but it only includes between 800 and 900 square miles of productive coal workings. Gypsum is found in several localities, and grindstones are largely exported. In the vicinity of the rivers oil-works have been erected for the manufacture of rock-oil.

**Government, Commerce, &c.**—The government is administered by a lieutenant-governor (whose official salary is £3000 per annum), aided by an Executive Council of nine members, a Legislative Council of twenty-two, and a House of Assembly of forty-one who meet at Fredericton, the capital. New Brunswick is well supplied with railways and other means of internal communication, connecting the commercial capital, St. John, with Halifax on the Atlantic, with Pictou on the Gulf of St. Lawrence, with Quebec, Montreal, and other places in Canada by the Inter-colonial Railway, and all the cities and towns of the United States by lines *à la* Bangor. Besides these, there are the Rivière du Loup line, *à la* Fredericton and Woodstock to the great river St. Lawrence, and several inter-provincial lines of considerable importance, comprising a total length of 1085 miles in actual operation. Free grants of land for purposes of actual settlement are also made in this province. The limit of the grant is 100 acres, and the customary conditions are enforced. The common school system prevails. Indian reserves are established on the Tobique River in Victoria County, and on the St. John, Iroquois, and Madawaska rivers in the same county. The chief exports comprise timber, fish, coal, and apples and other fruits. There is a militia force of about 3500 men and a reserve of about 60,000. The commerce is principally with the United States, Nova Scotia, and the United Kingdom. The colony was ceded to Great Britain with Canada in 1763, made independent in 1784, and became part of the Canadian Confederation in 1867. The district, in the year 1825, was the scene of one of the most dreadful, and certainly the most extensive, conflagrations on record—the noticeable event in the history of the colony. The fire

desolated the country for more than 100 miles along the river, to the extent of 60 miles from the south bank, and to a great distance on the northern side. At least 800 persons lost their lives, with an immense number of bears, wolves, deer, foxes, snakes, and other wild animals. Even the birds of strong wing could not save themselves, being confused by the smoke; and the fish perished in the lakes and streams, poisoned by the alkali formed by the ashes precipitated into the water.

**NEW CALEDONIA**, an extensive island in the Pacific, is situated between 17° 57' and 23° S. lat., and between 163° and 168° E. lon. The area is 7722 square miles, and the population about 30,000. The natives are of the Papuan negro race. The island was discovered by Captain Cook in 1774. The French took possession of it, with its dependency, the Isle of Pines, as a French colony, on the 20th September, 1853. It is inclosed by coral reefs, which connect innumerable small sandy islands or cliffs. From the shores the country gradually rises inland to a mountain range, which in some parts is 2000 or 3000 feet above the sea. The only cultivatable land lies on the sea-board, the interior being nothing but a continuous serrated mountain chain. The rivers are little better than mountain torrents, as may be expected from the narrow configuration of the island, subject to sudden rises and inundations. Coffee plantations have been frequently flooded four or five feet deep. Coffee and tobacco do well, and rice might be cultivated profitably if it were not for the locusts, which are a scourge to the island. Almost every article of food or utility is imported, and nothing but a little *copra* and some nickel and copper exported. The only manufactures on the island are those of soap and a little coarse pottery and bricks. There is a small shipbuilding yard in the harbour, where a few coasters are turned out. It is supposed that the island was formerly much more populous than at present. Cocoa-nut palms, bread-fruit trees, and mango trees abound on the shores. The French have for some time used the island as a penal settlement, and large numbers of Communists were transported thither after the outbreak of 1871.

**NEW COLLEGE**, Oxford, was founded in 1386 by William of Wykeham, bishop of Winchester and lord high chancellor of England, for a warden, seventy fellows and scholars, ten chaplains, an organist, three clerks, and sixteen choristers. By ordinances of the commissioners appointed under 17 & 18 Vict. c. 81, the fellowships and scholarships are now each thirty in number. Fifteen of the fellowships are open to those only who shall either have been educated two years at least at Winchester, or shall have been twelve terms at least members of New College. The other fifteen fellowships are without any such limitation. The scholarships are tenable for five years, and are of the annual value of £100. They are filled up yearly, at an election held at Winchester College, by boys receiving education in the school. The visitor is the Bishop of Winchester.

Most of the buildings of the founder in this college, after a lapse of more than five centuries, remain substantially entire. Wykeham's whole design may be still traced throughout, and even the original doors and windows remain in many instances. The chapel was restored by Wyatt in 1789. The five-hundredth anniversary of the foundation of the college was celebrated in 1879, when the chapel, which had been renovated at a cost of upwards of £20,000, was reopened. The hall was very carefully restored by Scott in 1866. The tower of this college, a pattern of massive strength, stands on the site of one of the bastions of the old city wall. The Holywell Street wing, from designs by Sir G. Gilbert Scott, was erected in 1876. The gardens of the college are of great beauty.

**NEW ENGLAND**, a name applied collectively to the former British possessions in North America, and now comprising the six eastern states of the Union—Maine,

New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The inhabitants are principally descendants of English Puritans and Scotch Presbyterians, and are familiarly designated as Yankees. They are celebrated for their industry and enterprise.

*New England or Yankee Speech.*—The first thing that strikes a man who begins seriously to study the peculiarities of Yankee speech is the fact that so many of them are really survivals, archaisms of Elizabethan date. What are stigmatized as new Americanisms are exceedingly often old forgotten traits of English speech, rooted in the soil of the Western Hemisphere over two centuries ago by the Puritans. Thus in Knox's "Ceilon" (Ceylon), published in 1681, we read, "*Feeling of the kernel, they know if they be ripe enough;*" and in Dampier (1703) we find, "We went ashore and dried our cloaths, dried our ammunition, and *fixed* ourselves against our enemies;" and elsewhere we find "*clear round.*" Examples might easily be multiplied. Mr. J. Russell Lowell (in 1883-85 American minister in England) in his "Biglow Papers" gives a most excellent introductory discourse on this topic, too often passed over by those who are eager to dive into the fun of that remarkable book, whereof no man tires. His general rules are these:—1. The genuine Yankee never rolls his *r*, nor sounds his final *g* if he can help it. Even *d* suffers, as in *han', stan', for hand, stand.* 2. In *while, when, &c.*, the *h* is quite mute. 3. In regard to *a*, he shows some inconsistency, sometimes giving a close and obscure sound, as *hee for here, ez for as, &c.*, and on the other hand making the *a* in *handsome* rhyme with the *a* in *father* (lahnsome). 4. He pronounces *ou* as *eu*, *an* as *ah*, thus *euor for our, and dahter for daughter.* 5. "To the dish thus seasoned add a drawl *ad libitum.*" Mr. Lowell gives a passage in Shakspeare in Yankee pronunciation, which serves as a complete *memoria technica*; it begins as follows:

"Now is the winta uv eour discontent,  
Med glorious summa by this sun o' Yock;  
An' all the clouds that leowered upon eour heouse,  
In the deep buzzum o' the oslin buried," &c.

**NEW FOREST.** a royal forest of England, in the south-west portion of the county of Hants. The forest is about 50 miles in circumference, reaching from the Wiltshire border to the sea-coast north and south, and east and west from the Southampton Water to Poole Harbour. A good deal of this is open heath or inclosed agricultural land. It was in early Saxon times called by the name of *Ytene*; but it was not afforested until the Conquest, when William I. established a great hunting-ground, guarding it by strict forest laws, upon which the popular belief in the ill-treatment of the inhabitants by the Conqueror is probably mainly founded, for it is now said that the dwellers were comparatively little interfered with. The forest abounds in game and supplies fine timber.

**NEW GRANADA**, now **COLOMBIA**, was first colonized by the Spaniards in 1510, and became a viceroyalty in 1718. Becoming independent of Spain in 1819, it united with Venezuela and Ecuador to form a federal republic. This compact was dissolved in 1830, and the three members were constituted separate republics. After various changes of the constitution, New Granada received a fresh organization, carried into effect in May, 1863, by which its provinces were converted into states federally united, to be officially designated The United States of Colombia. See **COLOMBIA**.

**NEW GUINEA or PAPUA**, deriving the latter name from a word said by some to mean "black," and by others "curled hair," either interpretation being appropriate, and obtaining the name of New Guinea from a Spanish explorer in 1545, because of some fancied resemblance between its coast and the Guinea Coast of Western Africa, is, excepting Australia, the largest island in the world, being, roughly speaking, about 1400 miles long and 400 broad at its

widest point. Its northernmost coast nearly touches the equator, and its southernmost stretches down to 11° S. lat. It is situated to the north of Australia, and is separated only by the breadth of Torres Strait—less than 100 miles—from Queensland. The area is estimated at 312,000 square miles. Beyond a few miles from the coast very little is known of the country, and reports differ considerably as to its value in a commercial sense. The island is generally described as consisting of a great central mass about the size of the Austrian Empire, and two peninsulas—one at the north-west, or Dutch, the other at the south-east, or English end, broken up into hills, mountains, detached chains, and valleys—the chains usually running parallel with the coast. For the first 20 miles inland the valleys are fairly fertile, the mountain-slopes less so; but further into the interior the land becomes more fertile, and is cut up in various directions by mountain-streams and water-courses. After the twentieth mile inland the character of the country totally changes; the gum-tree and the open country give way to dense forests of tropical vegetation, tall trees and undergrowth, which completely cover the hills with one impenetrable mass of foliage. The bird-of-paradise is then first seen. Cultivation is extensively practised by the natives. Each village owes the country surrounding it for several miles, and each family possesses a clearly defined plot of ground, as near as possible to its own home. Bananas form the principal item of cultivation, then yams and yaros. The bread-fruit tree, betel, mango, and sago-palm, are indigenous; also sugar-cane and sweet-potatoes, which latter attain an immense size. Tobacco, chillies, cucumbers, water-melons, vegetable-marrows, and small purple grapes, are cultivated in the interior; while wild oranges grow in the vicinity of Yule Island, and the nutmeg-tree near the Fly River. There are eight indigenous varieties of the sugar-cane, and in the open land a cotton-tree is not uncommon. The natives of Hood Point make annual trading voyages from October to January to Annapata (Port Moresby), bringing cocoa-nuts from the south and sago from the north, which they exchange for earthenware pottery. Some reports describe necessary food as scarce, and in parts the native dietary is eked out not only by cocoa-nuts but by shell-fish, lizards, beetles, and almost every kind of large insect. The principal or backbone range of mountains are called the Charles Louis or Snowy Mountains in the north, and other names according to the part of the island where they have been touched. Some of them have been roughly estimated as reaching a height of from 16,000 to 20,000 feet; at all events, they are seen to have snow on their summits, which, in a tropical climate, proves them to be of considerable altitude.

The country is well watered with streams, which have their sources in this range. At present only two rivers of any considerable magnitude are known. One, the Fly River, already partially explored, which possibly takes its rise about where the fifth parallel of latitude cuts the main range, flows southwards, and falls into the Gulf of New Guinea. The other, taking its rise apparently from the northern side of the Snowy Mountains, flows northwards with such immense volume that the sea is rendered brackish at a distance of 60 miles from its numerous mouths, situated on the eastern shores of Geelvink Bay. This river is known as the Ambernoli, and is as yet quite unexplored. Much of the coast-line is fringed with coral reefs, within which are several good harbours; other portions present bold cliffs, rising several thousand feet from the shore. The eastern shore takes the form of a huge fork, the lower arm of which is cut up into an archipelago of islands, and the northern arm a peninsula. Between the two lies a fine bay, 45 miles long and 12 or 18 miles in breadth. Terrible earthquakes have been experienced both in the north and west, but it is not yet known whether volcanoes occur

on the mainland. In the north-west and the adjacent islands, the raised coral beaches, and the alternation of recent coral-line limestones with ancient rocks, stratified and volcanic, seem to argue recent upheaval. Along the north coast, too, there is no barrier reef, only fringing reefs shelving suddenly into very deep water.

Clay ironstone has been observed at Humboldt Bay, and at Lakahia Island; and a lignite at Lakahia Island and in Galewo Strait; a black magnetic iron-sand with traces of gold is found in the streams of the south-east, and plumbago has been observed. In the eastern peninsula the pebbles and small fragments brought down from the interior, consisting of mica slate, quartz, sandstones, greenstone, and jasperoid rocks, show the formations there to be undistinguishable from the Silurian and Devonian series of the gold-fields of New South Wales. Rocks of similar age, with granite and gneiss, are also found in the interior of the north-west. There are some valuable pearl and sea-cucumber (*bêche de mer*) fisheries. The only kinds of animal which New Guinea possesses, besides the pig, are of the marsupial tribe; but there are some varieties unknown on the Australian continent, among them being a remarkable anomaly, a tree-climbing kangaroo. The birds are very numerous, and comprise those of the most brilliant plumage in the world. Besides the bird-of-paradise, parrots and cockatoos of gorgeous plumage abound in all parts, so that it has been sometimes called "the Land of Cockatoos." The cassowary is to be found, as also some large species of hornbill. The coast most accessible from Australia is swampy and unhealthy, but from Cape King William to Point d'Urville it is, with few exceptions, bold and high. Inland the plateaus are all that can be desired for salubrity, and can hardly be surpassed in any tropical country. The rainfall at Port Moresby in the wet season averages 34 inches, while the heat ranges from 73°-5°, the average minimum night temperature, to 90°-43° in the shade during February, which is the hottest month.

As to the inhabitants, we have again to deal with the most contradictory accounts. The most probable theory is that in New Guinea, as in south-east Asia and the Pacific islands, we have a mixture of races; the predominating types in the Indo-Pacific being the Caucasian and Mongolian, with an infusion of Negrito and perhaps of so-called Papuan blood. As a rule they appear to have a fair average physique and to be split up into numerous tribes ever ready to be at war with each other. In some places cannibalism undoubtedly prevails. The level of civilization varies considerably, but the average native is a savage of a high order. Although still in the "stone age," the artistic faculty is strongly marked, and perhaps more so among the western tribes than among the milder eastern. This is shown conspicuously in the carved ornamentation of their canoes, houses, implements, and weapons, and these tastes are further seen in the habit of adorning themselves with (among other things) flowers and leaves. The Malay practice of building on piles is also common, even high up on the mountain sides. In the south-east stockaded villages are built on the steep spurs of hills, surmounted by a *dobbo*, which serves both as a watch-tower and as a refuge from enemies, human and spiritual. In some places houses are ornamented outside with life-size figures of birds, fishes, and beasts.

The first European sailor who sighted the island was D'Abreu in 1511; the honour of being the first to land belongs most probably to the Portuguese explorer, Don Jorge de Meneses in 1526, on his way from Malacca to the Moluccas. In consequence of a fear that some foreign or hostile power might take possession of the coasts of New Guinea nearest to Australia, and so injuriously affect the interests of Queensland, a formal protectorate was proclaimed by the British government over the southern shores up to 141° E. lon. in 1884, and in 1885 the following agreement was

come to between the English and German governments. "The point on the north-east coast of New Guinea where the eighth parallel of south latitude cuts the coast forms the boundary on the coast, and a line described as under determines the boundaries inland of the respective territories:—Starting from the coast in the neighbourhood of Mitre Rock on the eighth parallel of south latitude, and following this parallel to the point where it is cut by the 147th degree of east longitude, then in a straight line in a north-westerly direction to the point where the sixth parallel of south latitude cuts the 144th degree of east longitude, and continuing in a west-north-westerly direction to the point of intersection of the fifth parallel of south latitude and of the 141st degree of east longitude. The British Possessions lie to the south of the line thus defined, the German to the north. The British Possessions do not include Long Island, or Rook Island, or any islands adjacent to New Guinea to the northward of the eighth parallel of the south latitude. As suzerain nominally under the Sultan of Tidore, the Dutch claim possession of the western part as far east as 141° 47' E. lat.

**NEW HAMPSHIRE**, one of the United States of North America, bounded E. by the Atlantic Ocean and Maine, N. by Lower Canada, W. by Vermont, and S. by Massachusetts. The length north to south is 160 miles; the breadth varies from 19 to 20 miles. The area is 9336 square miles. The population in 1880 was 347,384.

*Surface*.—The shores are rather low, and the country along them, to the distance of 20 or 30 miles inland, is in general level; but the land rises imperceptibly, so as to arrest the tides within 20 miles from the sea, though they rise to about 18 feet. This flat tract has a sandy soil of inferior fertility. At the back of it the surface becomes broken and hilly, and the hills gradually rise in elevation as they proceed further inland, until, at a distance of about 10 miles from the banks of the Connecticut, they constitute a continuous range, running nearly north and south. Some of the summits attain a height of 4500 feet. On approaching 44° N. lat. the chain expands into an extensive mountain group, which is known by the name of the White Mountains. The highest summit of this group, Mount Washington, is the highest mountain in the United States east of the Rocky Mountains, and attains an elevation of 6293 feet.

*Rivers and Lakes, &c.*—The Connecticut rises near the northern border of the state, in Lower Canada, and soon begins to form the boundary-line between New Hampshire and Vermont. The Merrimac rises in the White Mountains, and traverses the central districts of the state by a southern course. [See MASSACHUSETTS.] The Piscataqua, which forms the boundary between this state and Maine, rises near the southern declivity of the White Mountains in a small lake, and runs S.S.E. about 40 miles in a straight line. Its course is very rapid, and the tide ascends it only a short distance from the sea; but it forms the fine harbour of Portsmouth, one of the best in the United States. This state contains several lakes. The largest is Lake Winnepiscogee, which is 472 feet above the sea, 25 miles long, and from 1 to 10 miles wide. Squam Lake, to the north-west, is 5 miles long and 4 wide. The climate, owing to the various elevations, is dependent on position.

*Productions, &c.*—The principal crops are maize, wheat, and other grains, hops, potatoes, maple sugar, &c. Near Mount Washington there is abundance of timber. A considerable trade is also carried on in cattle, salted provisions, and wool. The cultivated land is generally better adapted for pasturage than tillage, consequently horned cattle are abundant and the dairies very good. Sheep and pigs are also common; but horses are small in size and not numerous. The rocky strata of the state consist of metamorphic rocks, mica and talcose slates, quartz, granular

limestones, granite, and gneiss, and contain magnetic and specular iron ores, beryl, tourmaline, mica, graphite, and stearite, or soapstone. The principal manufactures are of woollen and cotton fabrics, iron wares, and paper. The capital is CONCORD.

New Hampshire was first settled in 1623 at Dover and Portsmouth. It came voluntarily under the jurisdiction of Massachusetts in 1641, and was made a separate province in 1679 by an Act of Charles II. The constitution was formed in 1784, and amended in 1792.

**NEW HEBRIDES** is an extensive group of islands in the Pacific, situated between 16° and 21° S. lat., and between 165° 40' and 170° E. lon. The largest island, Tierra del Espíritu Santo, extends more than 70 miles from N.N.W. to S.S.E., with an average width of 25 miles.

Erromango, where the missionary Williams was killed, is one of this group. They consist chiefly of hills of moderate elevation, which, however, in some of them rise to the height of mountains. The valleys between these hills, and also the level tracts along the coast, are very fertile. Most of the islands are of volcanic origin. The inhabitants belong to the Papuan race, but with a considerable admixture of Malayo-Polynesian blood. Recently cotton has been extensively cultivated. Population, about 200,000.

**NEW HOLLAND**, an obsolete name for AUSTRALIA.

**NEW IRELAND** is an island in the Pacific, situated between 2° 25' and 4° 52' S. lat., and 150° 30' and 153° 12' E. lon. It is more than 180 miles long from south-east to north-west, but on an average not much more than 15 miles wide. Near the southern extremity, Cape St. George, there is a good harbour, called Port Praslin. The island has a hilly surface, and some summits rise into mountains 3000 feet high; all of them are covered with wood. Two of the most conspicuous peaks are called the "Mother and Daughter." The lower tracts are fertile and well cultivated. The inhabitants belong to the Australian negroes. New Hanover is situated further west, and is about 30 miles long from east to west.

**NEW JERSEY**, one of the United States of North America, bounded N. by New York, E. and S. by the Atlantic, and W. by Delaware and Pennsylvania. Its length north to south is 167 miles, and its extreme breadth 96 miles. The area is 7576 square miles. The coast-line, including bays and creeks, extends 540 miles. The population in 1880 was 1,130,892.

*Surface.*—About one-half of its surface south from Staten Island is so level that it is difficult to distinguish the watershed of the streams which fall into the ocean from those which empty themselves into Delaware Bay. All this tract is covered with a sea-sand alluvium. Along its eastern shores there is a series of long, narrow, and low islands. The northern half of the state is hilly, but the hills are of moderate elevation, and the wide valleys between them have a good loamy soil. The hilly tract covers somewhat more than one-fourth of the surface of the whole state. The most northern portion is divided between a marshy tract along the banks of the river Hudson, and a mountainous tract consisting of two ridges which traverse the north-western corner in a direction south-west and north-east. These ridges are mostly covered with forest trees, and the country between them has a good soil.

The large rivers of this state are those which constitute its boundary, the Hudson and the Delaware. A canal has been cut between these two, called the Morris Canal, which is 101 miles in length. There are several other canals in the state. Among the minor rivers the Raritan is the largest. It traverses the hilly district and falls into Raritan Bay at Ambey, which is a good harbour for vessels of middling size. The Raritan is navigable for 16 miles from its mouth.

*Climate.*—The difference of climate between the southern and northern districts is very great, and depends

mainly on the difference of elevation. The level sandy plains of the southern districts admit of the cultivation of cotton, while the mountainous northern districts experience early and severe winters.

*Productions, &c.*—Wheat, rye, Indian corn, oats, barley, buckwheat, flax, potatoes, and other vegetables, are the common crops; buckwheat is in very general cultivation. The cotton grown in the southern district is consumed for the domestic manufactures. Apples, pears, peaches, plums, and cherries are the common fruit trees. In the mountainous parts and salt marshes near the sea-coast great numbers of cattle are raised. Sheep are also extensively kept; and cheese, butter, and wool are produced. The forests are composed of oak, hickory, chestnut, poplar, ash, &c. The larger wild animals have disappeared, and only the racoon and fox remain. Iron abounds in the mountainous and hilly districts, and bog iron is found in the marshes along the sea. Good building stone is also extensively quarried.

The commerce of the state is considerable. The produce consists of live cattle, fruit, iron, butter and cheese, hams, flax-seed, cider, lumber, and some manufactures, especially leather, glass, paper, cotton and woollen goods, iron wares, earthenware, &c. In addition to its canals, the state is very well supplied with railway accommodation. The capital is Trenton.

*History.*—New Jersey was first settled by the Dutch in 1620, in those places contiguous to the Hudson. The Swedes established themselves here in 1628, but their settlements soon fell into the possession of the Dutch, who were supplanted by the English in 1664. The Dutch recaptured it in 1673, but it was afterwards sold to William Penn, who planted here several settlements. New Jersey was then a part of New York, from which it was definitively separated in 1736. It declared itself early against England in the revolutionary struggle, and published its first constitution 2nd July, 1776, two days before the declaration of independence by the Congress.

**NEW MEXICO**, one of the United States of North America, organized in 1850, is bounded by Texas, Mexico, California, Colorado, and Arizona. The length from east to west is about 335 miles; the breadth from north to south 350 miles; and the area 122,460 square miles. The population in 1880 was 118,430, of whom about 26,000 were Indians. The territory is a high table-land, crossed by mountain ranges, the heights attaining over 12,000 feet. In some parts fine grazing tracts abound, though very little land is susceptible of cultivation, on account of the absence of permanent running water for irrigation. Immense CANONS or deep ravines, where rivers flow hundreds of feet below the surface of the valleys, are found; and there are also lofty precipices, resembling castles or fortresses. Good pine timber abounds, and gold, silver, iron, lead, copper, coal, zinc, salt, and turquoise have been found in quantities yielding profitable returns. At present the great drawbacks to the development of the mines are the sparseness of the white population and the presence of hostile Indians. The Navajoes, Apaches, Cheyennes, and Comanches formerly infested the territory, and continually destroyed the property of miners. The great obstacle to gold mining is being removed by extensive water works. The capital of New Mexico is Santa Fé, which is 7000 feet above the sea.

**NEW ORLEANS** (the "Crescent City"), a city, port of entry, and the capital of the state of Louisiana, in North America, is situated on the left or N.W. bank of the Mississippi, where the river makes a great bend to the N. and W. The city is 105 miles from the mouth of the river by the course of the stream, and 90 miles direct distance. The current is very rapid. The population in 1840 was 102,193; in 1880 it had increased to 216,140.

The Mississippi opposite the city is half a mile wide,

and from 60 to 200 feet deep; and by the formation of jetties, in 1880, extending from the land's end into the deep waters of the gulf, the depth across the bar, which is  $2\frac{1}{4}$  miles wide, has been increased from about  $8\frac{1}{2}$  feet—the depth before the work was commenced—to a wide channel with a minimum depth of 31 feet through the jetties, and 28 feet at the head of the passage. The natural process by which the bar has been scoured away and solid banks formed behind the jetties appears to go on, and thus the mouth of the Mississippi is practically open for large ships from the head of the passes to the gulf, with a depth of 26 feet for a width of 200 feet, and a central depth of 36 feet. The town is about 4 feet below the level of the river when the water is highest, and is protected from inundation by an embankment called the *Levee*, about 10 feet high, and generally from 20 to 40 feet wide; but in one part its width is 500 or 600 feet. This levee forms a promenade, and a convenient place for depositing the cotton and other produce brought down the river.

New Orleans is built in a semicircle along the shore, one set of streets following the curve of the river, and the other running up from the river and crossing the former at right angles. It consists of the city proper and immense and beautiful faubourgs or suburbs, all regularly laid out and fairly well drained. The quaint and picturesque old city was built by the French, and forms a parallelogram, bounded on three sides by wide streets planted with trees, and on the fourth by the levee and river. The suburban dwellings are surrounded with shrubberies of lemon, orange, magnolia, and other trees. The northern faubourg is called the American town. The situation is exceedingly favourable for commerce, New Orleans being the emporium of the great valley of the Mississippi and its affluents the Missouri, the Ohio, the Red River, and others.

The Roman Catholic Cathedral is the most imposing public building; it has four towers, and massive walls ornamented with figures of saints in the niches. The other buildings are—a state-house, a custom-house (one of the largest buildings in America), a cotton exchange, a United States mint and land-office, several theatres, banks, numerous churches, the College of Orleans, several academies, a charity hospital, and other public institutions. The cemeteries are peculiar; owing to the low-lying situation of the city, the tombs are built of brick, rising tier upon tier from one to three storeys in height, and each coffin space is arched, as burial in the ground is never attempted except in the case of paupers, who are often washed out of the graves when the Mississippi overflows. Rain-water, collected in tanks, is generally used; but there are also water-works, which raise the river water by machinery, and distribute it through pipes of more than 16 miles in length.

The climate during eight or nine months of the year is very pleasant and mild, but the hotter months, July, August, and September, are unfavourable to prolonged out-door exertion. There is a liability in winter, autumn, and spring to very sudden changes of temperature, the thermometer making a difference of  $30^{\circ}$  to  $40^{\circ}$  in a few hours. Cold, however, is never of long duration. The city enjoys a remarkable exemption from disease, with the exception of yellow fever; but the danger from it is now materially lessened. Unfortunately the quarantine regulations are considered vexatious, as there is often more than a suspicion that they are employed unfairly for trade purposes.

The city is traversed in every direction by steam street railways, and in addition to its enormous river traffic, railways unite it with New York (1663 miles distant) and with all the other important towns of America. In the environs of the city there are large plantations of sugar, cotton, indigo, and rice, which are cultivated in a very perfect manner. New Orleans is the greatest cotton mart in

the world. Vast quantities of other produce, as rice, grain, flour, molasses, tobacco, cattle, and agricultural produce are exported through its port. Yet trade is not increasing as rapidly as in the northern cities, partly perhaps owing to the foolish action of powerful labour unions and the competition of other rising trade centres.

New Orleans was founded by the French in 1717. In 1762 it was conveyed to the Spaniards, who in 1800 re-conveyed it to the French. In 1803 it was purchased by the United States as included in Louisiana. On the 8th January, 1815, the British, under General Sir Edward Pakenham, made an attack on the city, but they were defeated by the Americans under General Jackson.

In the American civil war, the Federal fleet appeared before the city on the 25th of April, 1862. The Confederates having burned ships, steamers, and 11,000 bales of cotton, value 3,000,000 dollars, in order that they might not fall into the hands of their enemies, surrendered on the 28th of the same month.

**NEW PLYMOUTH**, a rising town of New Zealand, the capital of the province of Taranaki, picturesquely situated on the west coast of North Island, 120 miles S. of Auckland. It has some coach-building, furniture, rope, brick, and pottery factories and tanneries, and some iron-sand deposits. It is connected with Wellington by railway. The town was founded in 1840 by emigrants from Devon and Cornwall.

**NEW RED SANDSTONE** was the name originally applied to the red sandy formation found lying above the coal measures. It was used in contradistinction to *Old Red Sandstone*, or that red sandstone found beneath the Carboniferous. The group of strata to which the name New Red Sandstone was formerly applied has been since separated into *Permian* and *Trias*, of which the former, containing fossils allied to the subjacent Carboniferous and older formations, is classed with the Palæozoic, while the *Trias* is placed at the base of the Mesozoic, its uppermost beds having a stratigraphical connection with the succeeding formation and its fossils a Neozoic facies.

The *Trias* is still often called the New Red Sandstone, but owing to its former application the name has its objections.

**NEW RIVER.** See HERTFORD.

**NEW ROSS**, locally called *Ross*, is a market-town of Ireland, 14 miles north from Waterford, and 83 miles S.S.W. from Dublin, situated on the east side of the estuary of the Barrow, here a fine deep stream, which contains the united waters of the Nore and Barrow. A wooden bridge 510 feet in length, with a portcullis in the centre to allow vessels to pass, connects New Ross with the village of Rosbereon on the opposite side. The older parts of the town are seated on acclivities of the banks, and are very irregular. The modern portions occupy the strip of comparatively flat land by the side of the river: here the streets are regular, and the houses respectable. Ross contains a court-house, two Episcopal churches, two Roman Catholic chapels, four or five places of worship for dissenters, some monastic establishments, hospitals, a market-house, barracks, custom-house, &c. There are breweries and tanyards in the town, but no manufactures. The trade of the port is rather extensive, but for want of railway communication it does not increase much. At the landing-place on the east bank of the river, where new quays have been erected, there is a depth of from 15 to 26 feet at low water. Vessels of small tonnage can proceed beyond the town by the Nore to Inistoge, and by the Barrow to St. Mullins, and barges still further to Athy, where the junction of the river with the Grand Canal affords a water communication with Dublin on the one side, and Limerick on the other. The principal exports are grain, flour, wool, butter, fowls, and bacon. Above and below the town there is a salmon fishery, which has



greatly improved since the Salmon Fisheries Act, 26 & 27 Vict., came into operation. The number of men now employed in it exceeds 800. The management of the corporate property is vested in fifteen commissioners, under the Towns Improvement Act (1854). The population in 1881 was 6670. The town is very ancient, and was fortified in the thirteenth century. It was a parliamentary borough until 1885. Its situation is picturesque, being in one of the most beautiful parts of the county.

**NEW SOUTH SHETLANDS** is a group of islands situated S.S.E. of and about 600 miles from Cape Horn, between  $61^{\circ}$  and  $63^{\circ} 30'$  S. lat., and  $53^{\circ}$  and  $63^{\circ}$  W. lon. They extend from E.N.E. to S.S.W. over a space of nearly 300 miles, and consist of twelve islands of moderate extent, and a great number of rocks and cliffs. They were discovered in 1598 by Gheritz, and afterwards further explored by Cook and Weddell, and the southern portion by Biscoe in 1832 and by Captain Sir J. Ross in 1842. They have also frequently been visited for the purpose of taking fur-seals and sea-elephants, with which the shores abound. The islands seem to be of volcanic origin, and are uninhabited.

**NEW SOUTH WALES**, a colony belonging to Great Britain, situated on the south-eastern coast of the Australian continent, and bounded on the east by the Pacific Ocean, and on the south, west, and north by the colonies of South Australia, Victoria, and Queensland, the last two of which were included in its original boundaries.

The area of the colony is estimated at 309,000 square miles; and the population, according to the census of 1881, was 751,468. In 1888 it was estimated at 1,100,000. It owes its name to Captain Cook, who applied it to the whole eastern sea-board of Australia, from its fancied resemblance to the South Wales of his native land as seen from a vessel off the shore.

The physical geography, geology, aboriginal inhabitants, zoology, and botany of New South Wales are described in general terms in the article AUSTRALIA. It only remains to give some details in addition to what is there stated.

The coast-line along the South Pacific, 800 miles in length, is bold and rugged, presenting a wall of steep cliffs fringed with rocky ledges, but with very few sandy beaches. It is broken, however, at intervals by bays and inlets of varying magnitude, which form excellent harbours for shipping, often shut in by narrow mouths, scarcely visible at an inconsiderable distance.

Numerous streams descend the eastern slope of the highlands in tortuous channels to the ocean, subject to fluctuations from flood and drought, but admitting generally of steam navigation for some distance above their mouths throughout the year. The most southerly of importance, the Shoalhaven, is remarkable for the tremendous gullies through which it flows, some of which are from 1200 to 1500 feet deep with precipitous sides, composed of granite or dark-coloured limestone, forming scenery of the grandest description. The Hawkesbury, which discharges to the north of Sydney is formed by the junction of the Nepean and Grose at the base of the mountains, and has some of the oldest and most flourishing farms of the colony, with the towns of Windsor and Richmond, on its banks. The Hunter, further to the north, flows through a valuable agricultural and pastoral country, has a course of upwards of 200 miles, and enters the sea at the port of Newcastle. It is the Tyne of Australia, as carboniferous formations occupy an extensive area of its basin, and supply a coal which ignites readily, burns with a bright reddish flame, swells and agglutinates, like the Newcastle coal of England. The Murrumbidgee, Macleay, and Clarence Rivers are in succession more northerly. The inland flowing waters, on the western side of the mountains, either terminate in marshes or contribute to form the Murrumbidgee and Darling, which, after a long course, with a

generally diminishing volume, reach the Murray, some 400 miles distant from their sources.

A liability to occasional drought is the special defect of the climate, and is sometimes a great disaster. The annual amount of the rainfall is rarely deficient, but generally copious, though irregularly distributed. In some years the rains descend in torrents, often carrying away roads, gardens, walls, palings, and bridges. Every highway becomes a river, every bypath a brook, and every bank a cataract. Then for months together not a drop falls, and the sky seems as if it had never known a cloud. During unusually long droughts the cattle frequently perish both for want of water and the fodder which it sustains. During these seasons, when the vegetation is like tinder, bush-fires, accidentally kindled by the natives, or by a stockman throwing the contents of his pipe upon the ground, are of common occurrence, and become vast conflagrations if there is a breeze, endangering life and property.

Through the entire length of the colony a mountain range stretches from north to south, mainly running parallel with the coast, at distances varying from 25 to 120 miles. This range, known in its southern portion as the Australian Alps, and further north as the Blue Mountains, widens out at intervals into rough table-lands of 20 or 30 miles in extent, with lofty peaks varying in height from 3000 to 7000 feet, abounding with wild and picturesque scenery, and forming the watershed of the continent. These heights are physically remarkable for the gulf or bay-like valleys with which they are penetrated, vast and immensely deep, bounded on either hand by precipitous cliffs, and terminated by a similar facing of perpendicular rocks. To descend into them, it is frequently necessary to go round from 15 to 20 miles; and they can only be left by the way in which they are entered. The most extraordinary feature in their structure is, that though they expand to a width of several miles in the interior, they are generally so contracted at their mouths as to be almost impassable. In these sunk valleys, as they are often called, there is usually magnificent timber, but the tops of lofty trees, many hundred feet below the spectator standing on the boundary-walls, appear like brushwood. The mountain tract is unproductive to the agriculturist, but makes ample amends by the inexhaustible treasures of gold, copper, tin, iron, coal, and oil to be found in its offshoots and at its foot in all directions. Beyond this range there is a gradual slope to the vast plains of the interior, where millions of sheep and cattle are fed on the natural grasses alone. The narrow strip, 800 miles in length, lying between the dividing range and the coast, is the earliest settled and most populous.

The climate of New South Wales, though warmer than that of England, is salubrious and agreeable; but from the great extent of the colony and other causes, almost every variety may be found. The hottest month is January, when the temperature at SYDNEY, the capital, ranges from  $63^{\circ}$  to  $87^{\circ}$  Fahr.; and July is the coldest month, when the thermometer varies from  $48^{\circ}$  to  $64^{\circ}$  Fahr. The climate has been compared to that of Naples, the only difference being  $5^{\circ}$  of greater summer heat and winter cold at Naples than at Sydney. The air is clear and bracing, and the sky is cloudless for an average of 200 days in the year. Except ophthalmia, epidemic diseases are scarcely known.

Most of the crown lands in New South Wales are disposed of on the plan of "conditional sale." Any person willing to reside on the land may apply for not less than 40, nor more than 640 acres at once, accompanied by a deposit of one-fourth of the purchase-money, at the rate of £1 per acre, and the purchase-money must be paid in ten annual instalments. Capitalist selectors are allowed to compound for non-residence by paying 30s. an acre instead of 20s., and spending 30s. an acre in improvements during the first three years. A pastoral tenant is able to purchase conditionally a block of unreserved crown land, not less in



area than 3200 acres, nor more than 16,000 acres, at £1 per acre for all within 1 mile of a river frontage, and 5s. for the remainder, the frontage being 1 mile of length to 5 miles of depth, to be paid for in ten annual instalments, one-fourth forming the first annual instalment. Residence is enforced, and the expenditure of 7s. 6d. per acre in improvements within the first three years.

Wool is the staple product of the colony, and sheep-farming is the interest which has attained the most remarkable development. In 1887 New South Wales had 38,000,000 sheep, 1,300,000 horned cattle, 340,000 horses, and 200,000 pigs. The export of wool now exceeds 100,000,000 lbs. per annum, valued at between £5,000,000 and £6,000,000. As the produce of the pastoral interests, there must be added to wool the value of the live stock, preserved meats, hides and skins, and tallow.

Wheat, maize, barley, oats, and potatoes are the articles most largely grown, but it is found that tobacco and sugar flourish as well as in any part of the globe. Fruit of all kinds, including oranges, lemons, figs, bananas, and pine apples, are grown in abundance. Considerable attention is given to the cultivation of the vine for wine-making purposes, there having been 600,000 gallons of wine made in 1887. Sugar-growing is a thriving occupation, the product of which has sprung from 17,000 lbs. in 1867 to 35,000,000 lbs. in 1886. The total area leased for pastoral purposes in 1887 was 240,000 square miles. The extent of agricultural holdings was 33,000,000 acres, and the land in cultivation 900,000 acres.

The mineral resources of New South Wales are inconceivably great. Competent authorities pronounce the auriferous districts far larger than those of any other Australian colony, and as rich. Gold mining on a large scale may really be said to have only commenced since 1871 in New South Wales, though it was here that gold was first discovered in Australia. Most of the fields, however, were forsaken for the more shallow and easily-worked diggings elsewhere. The country is, however, in many regions literally covered with auriferous quartz reefs. The proclaimed gold fields are more than eighty in number, and comprise about 13,700 square miles. The gold produce of the colony averages between £300,000 and £400,000 per annum. In 1887 about 450,000 acres had been taken up under mineral lease for tin alone, which is found in almost limitless quantity and of remarkably fine quality in the beds of rivers and creeks, and is known as stream tin; it is also found in veins and lodes. Copper is widely distributed, and the industry is becoming very important and valuable. Silver lead, cinnabar, antimony, and plumbago are also found. Coal exists in the colony in supplies practically inexhaustible, and is exported in great quantities. Side by side with the bituminous coal are rich hematite iron ores. Oil mines of great extent have also been discovered, and are extensively worked.

The position of New South Wales is most favourable for commerce. There are numerous convenient harbours and rivers and Sydney, with its magnificent haven, appears destined to become the great emporium for the trade of the Pacific. The total value of the imports is about £20,000,000, and of the exports £17,000,000 per annum. The trade between New South Wales and the mother country was as follows in recent years:—

	Imports from New South Wales.	Exports of British and Irish produce.
1884, ...	£8,996,096	£8,403,530
1885, ...	7,115,870	9,106,789
1886, ...	7,060,428	7,605,889

The staple articles of import into the United Kingdom are wool, copper ore, and tallow. The chief articles ex-

ported are apparel and haberdashery, beer and ale, cotton manufactures, leather, iron, and woollen goods.

The constitution of New South Wales was proclaimed in 1856. It vests the legislative power in a Parliament of two houses, the first called the Legislative Council, and the second the Legislative Assembly. The Legislative Council consists of twenty-one members nominated by the crown for the term of five years; and the Assembly of one hundred and nineteen members, elected by seventy-two constituencies. A voter must be of age, a natural-born subject of the queen, or if an alien must have been naturalized for five years and resident for two years. There is no property qualification for electors, and the votes are taken by secret ballot. The executive is in the hands of a governor nominated by the crown, who by virtue of his office is commander-in-chief of all the troops in the colony. His official salary is £7000 per annum. He is assisted by a cabinet of nine ministers, who are responsible to the Legislative Assembly. The colonial naval defence force is represented by the Naval Brigade, a volunteer body stationed partly at Sydney and partly at Newcastle.

Nearly one-half of the public revenue is derived from customs duties, chief among them being the duties on spirits. The other sources of income consist of miscellaneous receipts and a stamp duty. The revenue for 1886 was estimated at £7,544,300, and expenditure, £9,078,868. The public debt of the colony amounted in 1887 to over £41,000,000, or about £40 per head of the population. The debt was chiefly incurred for railways, telegraphs, and other reproductive public works. In 1887 there were 1900 miles of railway open for traffic, and 400 miles under construction. The whole of the lines open were built by the government.

A considerable sum is annually voted for the encouragement of immigration to New South Wales by means of assisted passages, and the advantages which the capabilities of the colony offer to the immigrant are very numerous and highly important, while the necessaries and comforts of life are much cheaper, and the climate is fine and healthy. The first telegraphic post in the colony was erected in 1857, and it is now well provided with telegraphic communication in various districts.

As regards religion, all sects are on a footing of equality. According to the latest returns, the number of registered ministers in the colony is about 600, and of places of worship 1000. One-third of the attendance on religious services was at the Protestant Episcopal churches (Church of England), above a fifth at Roman Catholic churches, the residue being shared among the Wesleyans, Presbyterians, and other nonconformists. The colony has an excellent system of public education, supported from the public funds. There is a university at Sydney. The necessity of national arming is recognized by training the school children to the use of the rifle and concerted movement. Many large schools have a volunteer force of their own for drilling purposes, and five years' attention to drill in an adult corps earns the reward of 20 acres of land. Even in remote country villages there is a school of art or mutual improvement society; while in 1870, in Sydney, a free library was established, to the increase and maintenance of which the legislature votes every year about £6000.

It is less than ninety years since colonization first took place, and it was then under the unpromising conditions of a penal settlement. Captain Philip, the first governor of the colony, landed at Port Jackson on 26th of January, 1788, his fleet consisting of H.M.S. *Sirius*, three store ships, and six transports, conveying 1030 persons, of whom 775 were convicts, and 481 head of cattle, poultry, and other live stock; and most of the remarkable progress of the colony has been attained since 1851, when the population was only about 180,000.

**NEW STYLE.** See CALENDAR.

**NEW TESTAMENT.** See BIBLE.

**NEW YEAR'S DAY** (in French *le Jour de l'An*), the first day of the year, seems to have been celebrated by the most ancient nations as a solemn religious festival. By the Jew as well as the Mohammedan, by the Chinese, the Roman, and the Egyptian, it was marked by the observance of particular ceremonies. The early fathers, Chrysostom, Ambrose, and others, forbade the celebration of any festivities on this anniversary as a relic of paganism; but the joyous character of the day could not wholly be ignored, and while marking its occurrence by prayer and worship, Christians have also agreed to perpetuate those lively and innocent pastimes which have descended from their forefathers.

"The birth of a new year," says Charles Lamb, "is of an interest too wide to be pretermitted by king or cobbler. No one ever regarded the 1st of January with indifference. It is that from which all date their time and count upon what is left. It is the nativity of our common Adam."

But there has not been till comparatively recent times an agreement as to when the new year commences. The Gregorian reformation of the calendar was accepted by Catholic countries, but was long rejected by Protestants. It was adopted by England in 1752, when it was provided that the legal year should commence in future on the 1st of January, and not, as heretofore, on the 25th of March, and that, to correct the accumulated errors of the Old Style, eleven nominal days should be suppressed in September, 1752, so that the day following the second of that month should be styled the 14th. But it was long ere the London populace were pacified; crowds assembled, demanding back their eleven days. The Old Style, however, still practically prevails in the accounts of our English Treasury. Christmas dividends are not considered due till Twelfth Day. The first day of the chancellor of the exchequer's financial year is the 5th of April, old Lady Day, and with that day the reckonings of our annual budgets begin and end. It should be mentioned, also, that the ancient Jewish year opened, with variations due to their imperfect calendar, at some point near the 25th of March; but in the course of years errors have so accumulated that it now opens very nearly at the opposite equinox. Thus in 1885 the Jewish New Year's Day (the first day of the Jewish year 5646) fell on 10th September. Similar causes have operated on the Mohammedan calendar, so that the year, once beginning on the 16th July (the Hegira occurred 16th July, 622, and marks the Mohammedan era), began in 1885 on 10th October.

Among the old Romans the year in the earliest times began in March; and it was the second king of Rome, Numa Pompilius, who altered it to the 1st January. Janus, the god of the month, had two faces, one looking back over the year just closed, one looking forward into the future. The calends of January (1st January) were solemnized with public shows in honour of Janus and the goddess Strania; and the festivities of New Year's Day, Twelfth Night, and Shrovetide appear to be chiefly based on the ancient diversions. On New Year's Day Titus Tatius, king of the Sabines, once received, so say the Romans, a garland cut in a grove by the temple of the goddess Strenia, whose festival was on that day. *Strenia* was Sabine for "strength," and evidently is the same word as the Latin *strenuus*. Titus Tatius attributed much good fortune to the *strenia* thus received, and it became an annual custom. When the nations were united the Romans adopted the custom of presenting *strenua*, on their corresponding festival, the day of the god Janus. (The French derive their *jour d'étréennes* from the *strenua* of the Romans, and have extended the practice till the expensiveness of the gifts expected, as well as the large number of them to be given, has grown to be a serious tax.) On the 1st of January the Druids were wont to go into the forests to gather mistletoe from the oaks. A survival of this

ceremony is seen in the old Poitevin "*Auguislanneuf*," i.e., to the mistletoe on the New Year. In olden times sending round the wassail bowl (spiced ale) by a band of young girls was a recognized way of collecting small sums on New Year's Eve among the poor wherewith to find funds for the good cheer suitable to the time. New Year's Day was the season during nearly two and a half centuries for the Feast of Fools in mediæval France, when (and especially at Paris) all kinds of absurdities and even indecency were tolerated—a very saturnalia.

New Year's Day has always been memorable for presents. Sir John Harrington, of Bath, in 1602, sent to James I. (then James VI. of Scotland only) a curious lantern, beautifully embossed and engraved, and bearing the meaning legend, "Lord, remember me when thou comest into thy kingdom." Honest old Latimer, afterwards burned with Ridley at Oxford, instead of presenting Henry VIII. with a purse of gold, as was customary on the New Year's Day, presented him with a New Testament, having the leaf conspicuously doubled down at the highly inconvenient passage, Hebrews xiii. 4! In the reign of Elizabeth the greater part of the peers and peeresses, all the bishops, the chief officers of state, and several of the household servants gave New Year's gifts to her Majesty, consisting of a sum of money, or jewels, or trinkets, or rich apparel (see Nichols, the antiquary, on "*Queen Elizabeth's Progresses*."). The queen, indeed, is known to have quite relied on her *étréennes* as a substantial item in her wardrobe. The Archbishop of Canterbury generally gave her £40, and his Grace of York £30; the other bishops and most peers at least £20. The tradesmen all sent her gifts in kind, and were given to understand that they must be "right royal." The queen gave gifts also on her side, but the balance was always carefully made much in her favour. Pius (then very dear) were acceptable New Year's gifts to the ladies, and these, when compounded for in money, gave rise to our phrase "*pin-money*." Gloves, then very costly, were also general gifts. New Year's Day has, in popular estimation, long quite superseded Christmas in Scotland, from the national antipathy to prelate and its institutions.

**NEW YORK**, one of the United States of North America, bounded N. by Lake Ontario, the river St. Lawrence, and Lower Canada; S. by the Atlantic Ocean, New Jersey, and Pennsylvania; E. by Vermont, Massachusetts, and Connecticut; and W. by Pennsylvania, Lake Erie, and the river Niagara. Its length N. to S. is 300 miles, its breadth E. to W. is 326 miles. The area is 49,170 square miles. The population in 1880 was 5,083,173.

The state resembles an irregular triangle in shape, and though the apex alone reaches the ocean, yet still the coast-line is considerable, as Long Island is included, extending upwards of 100 miles from east to west. New England forms one side of the triangle; New Jersey and Pennsylvania supply the second; and the St. Lawrence with Lake Ontario and part of Lake Erie, the third. The territory shares the Falls of Niagara with Canada, and has several magnificent waterfalls on its own streams in the highland gorges. Besides the great frontier lakes named, with that of Champlain, also on the border, a large number are wholly interior and much admired, as Lake George, remarkable for its transparency and picturesque shores, a Loch Katrine on a larger scale. It is traversed by two ranges of the Appalachian Mountains, through one of which the Hudson River flows 50 miles from its mouth, forming the celebrated highlands, remarkable for their picturesque scenery, though the elevation nowhere exceeds 1700 feet. Other groups north of this rise much higher, especially in the Adirondack Mountains, between Lakes Ontario on the west and Champlain on the east. Here is Mount Marcy or Talarus, 5403 feet, the highest in the state, the mean height of which is 800 feet above sea-level. Low table-lands border Lake Ontario; and the interior of

the state is generally undulating, in the north-east covered with dense forest. The geology is very varied: the older groups of rocks generally prevail—those, namely, which are inferior to coal, of which there are no mines in the state. There are, however, abundant supplies of petroleum rock oil in the western part. Iron, limestone, gypsum, lead, copper, zinc, titanium, and salt are plentiful. The state has a larger extent of navigable waters than any other in the Union, and contains a great number of small lakes. Great anxiety is felt on account of the destruction of the timber in the Adirondack Mountains in the northern part of New York State, and the serious injury consequent thereupon to the great waterways leading to New York. The Hudson River is almost entirely fed by the small streams and lakes of the southern plateau of the Adirondack Wilderness. The Mohawk River finds its source in the same region, as does the Black River, which, by way of the Black River Canal, supplies the Erie Canal with water. The watershed of these streams is comparatively small, and that they are large and important streams is due to the fact that they rise in high mountains densely crowded with forests. These mountains attract a large precipitation of rain, and particularly snow; and the forests store up and protect the water from the evaporation and the loss which all regions stripped of their forests have experienced from the running off of water over the frozen surface of the ground.

*Islands.*—Long Island, Staten Island, and Manhattan Island are included in the state of New York. Long Island is 120 miles long, and the average width is about 20 miles. It is separated from Connecticut and the mainland of New York by Long Island Sound. The surface is generally level, and it contains Brooklyn and other important suburbs of New York. Staten Island, east of Long Island, is 11 miles long and 8 miles wide. Manhattan Island, on which the city of New York is built, is 15 miles long, and the average width is about 1½ mile.

*Climate.*—The mean annual temperature of the city of New York is between 51° and 52°, which is only 2° or 3° higher than that of London, though it is more than 10° nearer to the equator. But this is milder than in any other part of the state, except Long Island. In the vale of the Hudson River in January and February the thermometer sometimes sinks to 2° Fahr., and the river is frozen; the ice usually does not break up before the end of March. In summer the thermometer ranges between 60° and 80°; it sometimes rises to 85°, and for a few days to 90°, but rarely higher. The cold is much more severe towards the northern part of the vale of the Hudson. The Lake country, on the contrary, enjoys a milder climate, its temperature being generally at least 3 degrees higher than that of the valley of the Mohawk.

*Productions, &c.*—Maize, wheat, rye, barley, oats, potatoes, and turnips are generally cultivated. Immense quantities of melons are raised. Pease and beans succeed very well. Apples, peaches, and cherries are plentiful. In some parts flax and hemp are grown, especially in the Lake country. All the domestic animals of England are reared in New York with success. Indeed, horses and cattle are more numerous than in any other state. In the west and south-east there are still extensive forests, which consist of oak of different species, ash, walnut, pine, maple, beech, chestnut, birch, poplar, elm, cedar, hemlock, and hickory. Deer are still common in the western districts and northern region. Other wild animals are—gray and red foxes, racoons, skunks, minks, beavers, otters, squirrels, and hares. Swans, wild geese, ducks, and pigeons are abundant. The canals and railways are numerous. The manufactures carried on comprise an immense variety of articles; and the foreign commerce is greater than that of any other state. The exports exceed in amount one-half of the total of the United States.

ALBANY is the legal capital. Names of places have been liberally culled from sources ancient and modern, sacred and secular. The state has a Troy, Attica, Ithaca, and Marathon; a Rome, Carthage, Syracuse, and Utica; a Carmel, Gilboa, Salem, and Zoar; a Peru and Lima, China and Pekin, Russia and Warsaw, Cairo and Delhi; and even a Paradox.

*History.*—The Hudson River was discovered by Henry Hudson, an Englishman in the service of the Dutch, in 1609. The first permanent settlement, called New Amsterdam, was made by the Dutch on Manhattan Island in 1621. In 1664 the English took the country, and by the treaty of Breda the Dutch confirmed the colony to them. In 1673 the Dutch retook the city of New York, but it was restored to the English by the treaty of Westminster in the following year. In 1777 New York adopted the constitution of the United States. The present constitution was framed in 1821.

NEW YORK, the principal city of the state of New York, and the commercial capital of the United States, is situated on the south end of Manhattan Island, at the confluence of the Hudson with the strait called East River. The number of inhabitants in 1880 was 1,206,590, the estimated population in 1885 was 1,400,000, the death-rate per 1000 inhabitants 25·81; but if Brooklyn and other adjacent suburbs be included the former would be quite 2,000,000. The harbour of New York, in point of spaciousness and shelter, as well as of the beauty of the surrounding scenery, is not surpassed by any in the world. It is about 8 miles long, and from 1½ to 5 miles wide, and affords a safe anchorage for the largest vessels. The entrance, which is by a channel called the Narrows, between Long Island and Staten Island, is no more than a quarter of a mile in width, and is defended by twelve forts. A new maritime approach to the harbour by Long Island Sound and the narrow strait called the East River, has recently been opened for the ocean traffic. It was formerly obstructed by an immense rock, 9 acres in extent, which blocked the channel, known as Hell Gate, but this rock was blown up in 1885—being the greatest engineering feat of the kind ever accomplished. The preparations extended over more than nine years. Tunnels were driven into the rock in every direction (their total length measuring 21,670 feet), at a depth of 50 feet beneath the low-water level. More than 300,000 lbs. of dynamite and other explosives were placed in 14,000 cartridges, which were all connected by electric wires with a battery. The commercial intercourse with the interior and with the western states is provided for by means of the Hudson and the system of canals and railways.

The island on which the city is built occupies a triangular area of 22 square miles, its apex being covered with old, narrow, and crooked streets, though by far the greater part of New York consists of regular and handsome thoroughfares, generally crossing each other at right angles. Many of them are divided into blocks, twenty of which go to the mile, and which are each known by numbers. Of late years the tendency has greatly increased to build lofty and large dwelling-houses, which are let out as flats or apartment houses and immense business offices, and the result has been to greatly improve the appearance of the wealthier portions of the city; but beyond these the bad paving, the defective municipal arrangements for the removal of dirt, and the disgraceful overcrowding of the labouring and immigrant population, render New York one of the most unpleasant great cities in the world. The houses are generally built of brick or brown sandstone, the principal edifices being faced with white marble. Broadway, the principal street, which runs through the centre of the city, is nearly 4 miles long and 80 feet wide, extending from the Battery to the Central Park. It contains several handsome churches, many of the principal hotels, the city hospital, and a great variety of elegant warehouses. Wall

Street, which branches off from Broadway, contains the exchange and most of the city banks, as well as the greater part of the merchants' and brokers' counting-houses, and the insurance offices. Fifth Avenue is the favourite place of residence for the aristocracy of business wealth. Many of the public buildings are pretentious at least, even if there may be a doubt as to their artistic effect. The City Hall, the front of which is of white marble, is 216 feet long, 105 feet wide, and 60 feet high. It contains the courts of law and the places of meeting for the municipal bodies. It is finely situated in the middle of City Hall Park, which covers an area of about 11 acres. The Merchants' Exchange is a splendid building, of blue granite, though the situation does not exhibit it to advantage. The Post-office is a fine building, of white marble. The Custom-house is of white marble somewhat resembling the Parthenon. The other principal buildings are—the Hall of Justice, of light-coloured granite; the Hall of the University of New York, a handsome Gothic building; Columbia College; the Cooper Institute; Trinity Church in the Broadway, a very fine Gothic structure; St. Paul's Episcopal Church, with an Ionic portico, and steeple 224 feet high; St. Patrick's Cathedral; St. John's Church, with a steeple 240 feet high; and the Dutch Church, a handsome Gothic building. Several other churches are fine structures. There are altogether more than 500 churches, belonging to a great variety of religious sects. The hotels are upon a vast scale, magnificently fitted up, and several of them capable of containing upwards of 1000 persons—the system of visitors residing in hotels rather than in private houses being much more common in America than in England.

New York contains about thirty theatres, numerous clubs, and an opera house with seats for 4700 spectators. There are several studios and art exhibitions, and a museum of natural history was founded in 1869. Columbia College is one of the oldest in the country; the University of New York has been more recently established. There is a very large number of grammar and other schools, and also several purely theological seminaries. The Astor Free Library has over 150,000 carefully selected volumes, and there are several other libraries of very respectable proportions. The hospitals and charitable institutions are on a liberal scale, and besides legal outdoor relief, the poor are cared for by a public society with agents appointed to different districts. The most noticeable charitable buildings are—the New York hospital, infirmary, deaf-mute, and lunatic asylums, and "Long Island Farms," the latter supported from a fund for the provision of destitute children. Among the chief open spaces are—Washington Square, in front of the New York University; Union Square, with a fountain; and the Central Park—the latter a public domain of great size, which is considered one of the finest city parks in the world. It lies in the upper part of the city, and covers an area of 813 acres, beautifully diversified in surface, and extending 2½ miles in length by 1½ in breadth. There are several smaller parks and squares. The Battery is a public ground on the south point of the island, containing 11 acres, on the extremity of which the Castle Gardens immigration depot is situated. In the vicinity of the city is Greenwood Cemetery, covering an area of 242 acres. An expensive and useful public work undertaken by the city was the aqueduct called the Croton Water-works, which conveys a supply of pure river water. The dam at the Croton River is 88 miles from the reservoirs at New York, which are large enough to receive 1,200,000,000 gallons.

The manufactures of New York are very various, and its commerce of vast proportions. Indeed, it has become the great centre of American finance and commerce. It receives nearly 70 per cent. of all the imports, and sends out more than 50 per cent. of the exports of the whole of the United States. The value of the imports to New York in 1886

was £90,117,225, and of the exports £63,475,125. The imports from the United Kingdom were valued at £20,944,192, and the exports thereto at £29,739,216. The customs' revenue for the same year amounted to £26,000.

There are no inclosed docks, except the Atlantic Dock at Brooklyn, which covers 4½ acres and has a sea-wall of 3000 feet. For repairing ships there are slip docks or marine railways, and the sectional dry docks on the East River. In the government navy yard at Brooklyn is the finest graving dock in America, but it is not available for ships of war. New York has been fortified seaward to protect it from any hostile attack in that direction. Regular lines of packets maintain communication with all the principal ports of the United States, the West Indies, Mexico, and South America; and with Liverpool, Southampton, Havre, Hamburg, Bremen, and Sweden. The shortest sea-route to England is 3016 miles. The city is connected with the mainland of New York by bridges across the Haarlem River, with Brooklyn by a suspension bridge, opened in 1883, the longest in the world, being 5989 feet in length, 85 feet in width, with a footway, two car tracks, and beyond these waggon ways, and has a clear height at the centre above high water of 135 feet. It is also connected with New Jersey, Long Island, and Staten Island by several steam ferries, which daily carry hundreds of thousands of passengers. Ten railways radiate from the city, which has telegraphic communication with every town of importance in America. An elevated railway carried on iron trestles facilitates the internal communication. The municipal arrangements were long a reproach to the United States for their corruption and jobbery, but the passing of an Act in 1883, requiring that an examination must be passed before offices can be held, and the disclosure of gigantic frauds by the "Tammany Ring" in 1870-76, have acted as a check on the worst abuses. The city is divided into seventeen wards, and the local government is conducted by a mayor, alderman, and common council. The police stations are connected by telegraph, and have lodging for destitute persons. A Compulsory Education Act came into force in 1875; its provisions, which are thoroughly enforced, making school attendance compulsory for at least fourteen weeks in the year, between the ages of eight and fourteen years. The commissioners of charity have the direction of asylums, hospitals, and prisons, and commissioners of immigration receive and attend to the wants of immigrants. There is an effective militia of sixteen regiments for the protection of the city, and an extensive and well-equipped fire brigade, under municipal control. The situation of the city is considered healthy. The bulk of immigrants to America arrive at the port, and 320,197 landed in 1884. The city debt in 1887 was £25,952,445—against which there is a sinking fund of £8,488,325.

The bay of New York was entered in the year 1523 by Verazzano, an Italian in the service of the French, its first European visitor. Hudson, the English navigator, discovered the river which now bears his name. The Dutch settled the colony and founded the city as New Amsterdam in 1621. Governor Stuyvesant surrendered it to the English in 1664, when the name was changed to New York, in honour of the Duke of York, afterwards James II. It was the seat of the first American Congress, and of the inauguration of Washington as the first president of the Republic. At the period of the revolution the city was smaller than Philadelphia or Boston, but gradually increased in importance, especially after the completion of the Erie Canal had opened to it the commerce of the west.

**NEW ZEALAND**, an important British colony in the southern hemisphere, consisting of three principal islands, the North, the South, and Stewart Island, arranged in a curving chain, about 1200 miles to the south-east of Australia, nearly midway between the Cape of Good Hope and

Cape Horn, and making a close approach to the antipodes of the United Kingdom. The South (or Middle) Island, much the largest, containing 55,224 square miles, forms a tolerably regular oblong. The North Island, separated from it by the noble channel of Cook Strait, 20 to 80 miles in width, is the next in size, embracing 44,736 square miles, and is remarkably different in its outline, being singularly torn and contorted. Stewart Island is comparatively small and unimportant, being only 1300 square miles in extent. Included under the New Zealand government are the Chatham Islands (360 miles eastward), the Auckland Islands (180 miles south), and a few others; the whole embracing 104,027 square miles—a little less than the area of the United Kingdom. The whole group is nearly 1000 miles long and 200 miles broad, and the coast-line extends over 1000 leagues. Up to 1888 about 19,000,000 acres had been alienated from the crown. The white population was estimated at 680,000 in 1888. In addition the aborigines or MAORI (who are described in a separate article) number 44,000, two-thirds of whom are in the province of Auckland, in North Island. In 1878 the white population only numbered 432,519.

*Surface, Soil, Rivers, &c.*—These islands are of volcanic formation, and consist of sandstones and shales. A chain of lofty snow-clad mountains extends through the whole of the central part of South Island and the south-east end of North Island. The former range is called the Southern Alps, and its highest peak is Mount Cook, 12,349 feet above the level of the sea. Mount Kaikora, in Nelson province, is 9300 feet, and Mount Arthur is 8000 feet high. The town of Wellington has suffered from earthquakes, and there are several volcanic cones, the chief of which are—Mount Egmont, on the west side of North Island, which has an elevation of over 8000 feet; and Tongarito, in the centre of the same island, which is 6500 feet high. In the King Country the snow-clad summit of Ruapehu rises to a height of 9000 feet, and to the south-east of this mountain lies the Outapu Desert, or “Desert of Sacred Sand,” extending over an area of above 50 square miles; the surface is so entirely covered with volcanic deposits, and with vegetation growing on the remains of the forests, overwhelmed by the lava, scorice, and ashes of Ruapehu when in a state of activity, that the traveller has often to cut a way through the thick shrub and tangled vines. The humidity is very great, but does not seem to cause malaria. Warm lakes and pools, with springs in a state of ebullition, forming beautiful geysers, and sending off clouds of steam, are further evidence of the existing action of subterranean heat. The soil on the table-lands, in the valleys and near the coasts, is generally fertile, and the surface is well wooded, all the native trees and plants being evergreens. The celebrated Kauri pine, and the New Zealand flax plant (*Phormium tenax*) are abundant. Indeed, the two main islands probably contain 10,000,000 acres of forest land, affording every variety and size of timber required for house and ship building. It is stated that this colony is almost the only country south of the equator which grows any free working wood of the pine character, but government control of the cutting is even now called for. The sides of the mountains are overgrown with ferns and grasses. The largest river in North Island is the Waikato, which flows north, with a winding course of 200 miles, and falls into the sea on the west coast, forming Waikato harbour. Together with the Waughu, it rises in the sides of Ruapehu, above the snow-line, at an altitude of over 7000 feet. In South Island the chief river is the Clutha, rising north of Lake Wanaka, and discharging 50 miles south of Otago harbour, after a course of 220 miles. The navigation of most of the New Zealand rivers is impeded by bars. South Island has numerous large and deep mountain lakes. Knowsley River forms a bay at the south end of South Island. Cook Strait (named after its dis-

coverer) separates the North Island from the South; and the latter is divided from Stewart Island by Foveaux Strait. The climate is equable, pleasant, and salubrious, much resembling that of England, with half the cold of an English winter. The temperature ranges from 39° to 74° Fahr. The mean of the year is about 58° Fahr. The mean annual rainfall is from 36 to 40 inches. Snow rarely falls in the valleys, but heavy rains and high gales are frequent. Besides a few harmless lizards, a small species of rat is the only indigenous four-footed animal found in either of the islands: hawks are numerous. The country is destitute of snakes, and possesses no insect so noxious as the English wasp. The pig, introduced by Cook, runs wild, and the red and fallow deer, the pheasant, partridge, quail, &c., and the commoner domestic animals introduced by colonists, thrive well.

The grazing grounds afford pasture all the year round, and an immense number of sheep are reared. Potatoes, wheat, maize, and other grains and vegetables have been successfully introduced by the colonists, and afford them a copious supply of food. Tea and silk are said to be likely to be profitably produced. The mineral products are valuable and extensive. Among them are gold, copper, iron, and coal. The latter is of excellent quality, and widely distributed over the colony. The gold-diggings are in Auckland, Canterbury, Nelson, and Otago. Those of Auckland are not very productive. Iron sand has been found in the neighbourhood of Dunedin, and mineral stores of immense extent are believed to exist not far below the soil in various parts of New Zealand, but they have not yet been much worked.

*Government, Commercial Statistics, History, &c.*—The legislative power is vested in the governor (salary and allowance £7500) and a general assembly consisting of two chambers, the first called the Legislative Council, consisting of fifty members, and the second the House of Representatives, of ninety-five elected members, of whom four are Maories. The qualifications of electors are as follow:—(1) Residence in the colony and electoral district for six months immediately preceding registration by white males twenty-one years of age; (2) possessors of a freehold estate of the value of £25; (3) every male Maori, twenty-one years of age, whose name is on a ratepayer's roll, or has a freehold estate of the value of £25. The colony is divided into fifty-two counties. WELLINGTON, in the North Island, is the capital and the seat of government. The civil and criminal law is virtually the same as in Great Britain. The University of New Zealand is solely an examining body, and grants degrees by virtue of a royal charter. It awards a number of scholarships to be held by students at affiliated colleges. In addition to four institutions of minor importance there are three affiliated colleges, viz.—Otago University at Dunedin, Canterbury College at Christchurch, and University College at Auckland. In 1877 a scheme of general education for the whole colony was enacted, based on the English Education Act. There are six Protestant bishoprics, and three Roman Catholic bishoprics in the colony. At the census of 1881 the total Protestants numbered 387,767, and Roman Catholics 68,984, or 14.08 per cent. of the population. There are 1536 Jews, 4936 pagans, and 13,978 objected to state their religion. Of the Protestants the Episcopalians comprise 41½ per cent. Presbyterians, with their various divisions, rank next, claiming about 23 per cent.; Wesleyans can claim 9½.

In 1886 the total revenue was £3,751,482, chiefly derived from customs, railways, stamps, excise, sale of crown lands, and mining and gold duties. The public debt in 1887 was £31,000,000. A portion is to be repaid gradually by a sinking fund, which amounts to £3,000,000. The value of the wool exported increased from £1,354,000 in 1866 to above £3,000,000 in 1887.

The total value of the imports and exports, including

bullion and specie, from and to all countries, rose as follows from 1859 to 1886:—

	1859.	1886.
Imports, .	£1,551,030	£6,672,791
Exports, .	551,185	6,487,854

The trade is chiefly with the various Australian colonies and the United Kingdom. The imports and exports for the United Kingdom have been as follows in recent years:—

	Imports from New Zealand into the United Kingdom.	Exports of British and Irish produce to New Zealand.
1884, .	£6,014,723	£3,696,039
1885, .	5,137,300	3,901,070
1886, .	4,717,465	3,306,806

The article received of greatest importance is wool. The chief articles sent to New Zealand are apparel and haberdashery, iron and leather manufactures, and woollen and cotton goods. In 1888 there were 600 miles of railway open for traffic in North Island, and 1100 in South Island, besides 90 miles of private lines—about 1800 miles in all. There are also about 700 miles under construction. The area of land under cultivation is 1,300,000 acres, and the live stock consists of 200,000 horses, 900,000 cattle, 17,000,000 sheep, and 370,000 pigs. Shipbuilding and the timber trade are important elements of the industry of New Zealand.

The territory of New Zealand was discovered by Tasman in 1642, who examined the western coast; and by Cook on the east side in 1769. The first settlements were made by whalers and others from Australia. The Church Missionary Society commenced its labours in 1814, and were followed by the Wesleyans and the Roman Catholics. The New Zealand Company (formed in 1837) sent out the first regular colony in 1839, and the first settlements were made on the shores of Cook Strait. In 1810 the British government established the colony, and made Auckland the seat of government. In 1851 the company made over its affairs to the government for a money consideration of £268,370. In 1863-65 a large number of the more civilized natives waged a formidable war against the European settlers, on the ground of disputed right with the government about the land. Peace was restored in 1866, but further disturbances occurred in 1868-69. Thanks, however, to a judicious policy of conciliation pursued by the colonial government, the "native difficulty" was en-

tirely removed, and the colony entered upon a course of very remarkable prosperity.

**NEWARK**, the Birmingham of America, a city of the United States, in New Jersey, situated on the right bank of the Passaic, 3 miles from Newark Bay, and 9 west of New York. It is a well-built and increasingly flourishing city. The court-house and numerous places of worship are the chief buildings. The principal manufactures are jewellery, leather, and india-rubber goods, carriages, machinery, &c. The coasting trade is considerable. The population in 1880 was 136,508.

**NEWARK-UPON-TRENT**, a market-town and municipal borough of England, in the county of, and 19 miles north-east from Nottingham and 120 from London by the Midland and Great Northern railways, is situated on the eastern bank of a branch of the Trent, which, about 2 miles south of the town, divides into two channels, and about the same distance north unites again, thus forming a river island, on which are the ruins of the ancient Castle of Newark, rebuilt in the reign of Stephen. The town extends about a mile along the bank of the river, and consists of several streets, with a market-place in the centre. It has been much improved in modern times; an extensive system of drainage has been carried out and a good supply of water obtained. It contains a handsome town hall, corn exchange, a court-house, a very large parish church of elegant Perpendicular architecture, which has been restored and a memorial window to the Prince Consort inserted, a hospital, several places of worship for dissenters, a free grammar-school, a fine free library, and various other schools. There is also a beautiful cross of the fifteenth century. A considerable trade is carried on in corn, coal, cattle, wool, linen, malt, and flour, and there are some agricultural implement works, iron foundries, plaster of Paris works, and large breweries. There are also some extensive lime and gypsum quarries in the neighbourhood. The municipal borough is divided into three wards, and is governed by six aldermen and eighteen councillors. The population in 1881 was 14,018.

The castle was formerly an important military stronghold, in which King John ended his days. Its enlargement at an early date, the "New Work," originated the name of the town. Warmly adhering to the fortunes of Charles I., the inhabitants and garrison successfully resisted two sieges, and the place was only given up on his voluntary surrender to the investing Scotch army in a neighbouring field. Extensive ruins of the castle remain. Newark returned two members to the House of Commons until 1885.











